ENGINEER

AND

ARTILLERY OPERATIONS

AGAINST THE

DEFENCES OF CHARLESTON HARBOR

IN 1863;

COMPRISING THE DESCENT UPON MORRIS ISLAND, THE DEMOLITION OF FORT SUMTER, THE REDUCTION OF FORTS WAGNER AND GREGG.

WITH

OBSERVATIONS ON HEAVY ORDNANCE, FORTIFICATIONS, ETC.

By Q. A. GILLMORE,

MAJOR OF ENGINEERS, MAJOR-GENERAL OF VOLUNTEERS, AND COMMANDING GENERAL OF THE LAND FORCES ENGAGED.

WITH THE

OFFICIAL REPORTS OF CHIEF OF ARTILLERY, ASSISTANT ENGINEERS, etc,

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ILLUSTRATED BY SEVENTY-SIX PLATES AND ENGRAVED VIEWS.

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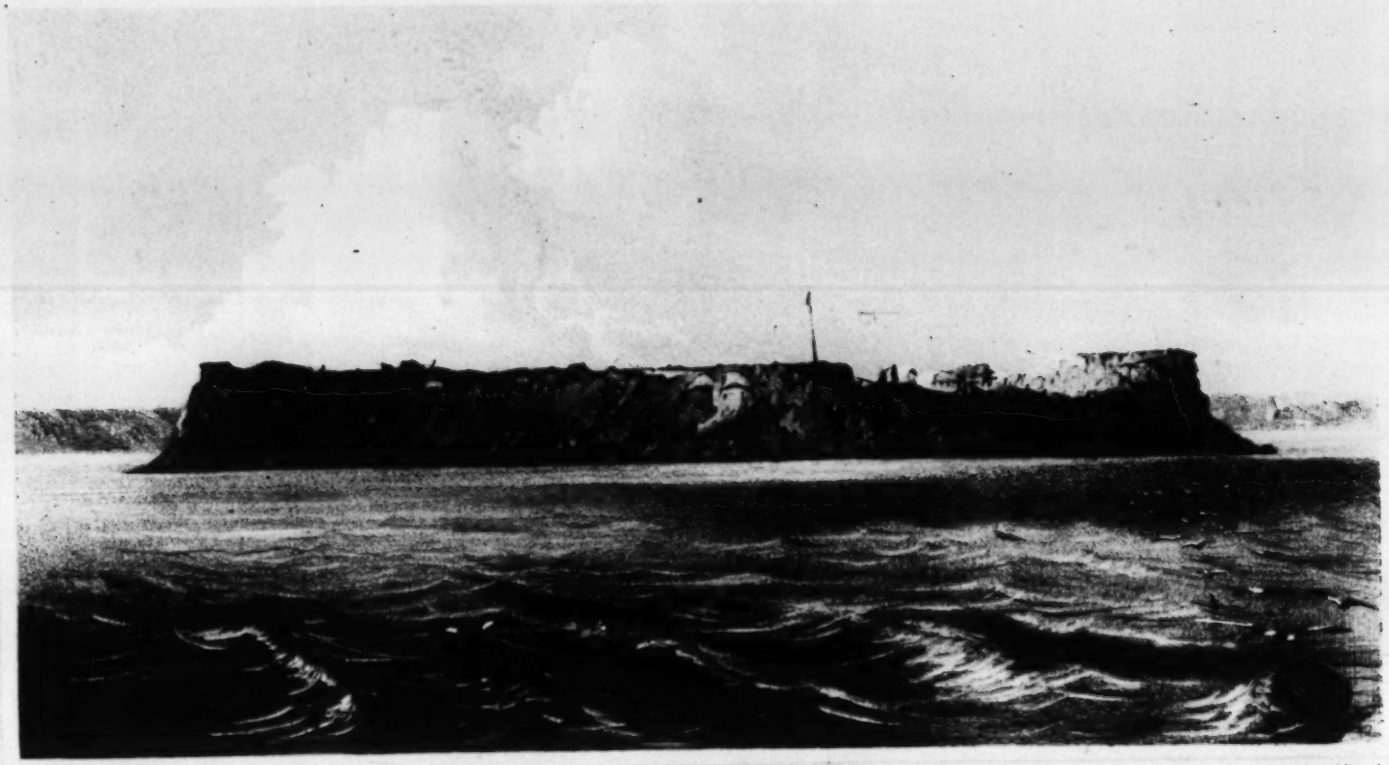

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FORT SUMTER.

November 10th 1862

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FORT SUMTER.

November 10th 1865

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TO THE HONORABLE

EDWIN M. STANTON,

FOR HIS TRUTH AND CANDOR AS A MAN.

HIS PURITY AS A PATRIOT,

AND HIS WISDOM, ENERGY, AND JUSTICE

AS A PUBLIC OFFICER.

NOTE.

It is proper to state that the general Report of the Campaign of 1863, before Charleston, submitted to the General-in-Chief, has been somewhat enlarged, more particularly the observations and suggestions on the subjects of heavy ordnance and fortifications, in preparing it for publication.

It was the original intention to publish the reports of all the subordinate commanders, but some of them were not received until about a month since, too late to take their proper place in the work, or to be used in making up the general Report, while others have not been received at all. The work, however, has been made sufficiently full and complete without them.

Q. A. GILLMORE.

NEW YORK, *Nov.* 16, 1864.

TABLE OF CONTENTS.

PAGE

REPORT OF MAJOR-GENERAL Q. A. GILLMORE, ... 7

APPENDICES.

A. REPORT OF BRIGADIER-GENERAL J. W. TURNER, CHIEF OF STAFF AND OF ARTILLERY, ... 135

SUPPLEMENTARY REPORT OF BRIGADIER-GENERAL TURNER, ... 148

B. REPORT OF MAJOR T. B. BROOKS, A. D. C. (ASSISTANT ENGINEER), ... 158

C. REPORT OF COLONEL EDWARD W. SERRELL, COMMANDING REGIMENT OF NEW YORK VOLUNTEER ENGINEERS, (ASSISTANT ENGINEER), ... 267

D. REPORT OF LIEUTENANT CHAS. R. SUTER, U. S. ENGINEERS, (ASSISTANT ENGINEER), ... 294

E. REPORT OF LIEUTENANT PETER S. MICHIE, U. S. ENGINEERS, (ASSISTANT ENGINEER), ... 300

F. REPORT OF CAPTAIN FOXHALL A. PARKER, U. S. N., ... 310

G. CORRESPONDENCE BETWEEN GENERAL BEAUREGARD AND MAJOR-GENERAL GILLMORE, ... 312

H. CORRESPONDENCE BETWEEN REAR-ADMIRAL DAHLGREN AND MAJOR-GENERAL GILLMORE, ... 317

I. STATEMENT OF R. P. PARROTT, ... 350

LIST OF PLATES AND VIEWS

PLATE.

I.—CHART OF CHARLESTON HARBOR, AND ITS APPROACHES.

II.—MAP OF THE SIEGE OPERATIONS.

III.—APPROACHES TO FORT WAGNER, &C.

III.(*bis*).—SECTIONS OF APPROACHES, AND OF FORT WAGNER.

IV.—LEFT BATTERIES USED AGAINST FORT SUMTER AND FORT WAGNER.

(*The above named Plates are at the end of the Volume.*)

V.—FORT SUMTER (PLAN AND SECTIONS), facing page 66.

VI.—VIEW OF FORT SUMTER, AUGUST 23rd, 1864, facing page 68.

VII.—PLAN OF FORT WAGNER, facing page 76.

VIII.—(Frontispiece.) VIEW OF FORT SUMTER, NOV. 10th, 1864.

XI to XXXIII.—BURSTED PARROTT RIFLES, WITH RECORDS OF FIRING.

XXXIV.—5-INCH WHITWORTH RIFLES.

XXXV to XXXVIII.—CONFEDERATE PROJECTILES.

XXXIX.—AMES' WROUGHT IRON RIFLE. CALIBER, 7 INCHES.

(*Plates IX to XXXIX follow page* 133 *in regular order.*)

The following sixteen Views are not numbered:

Splinter-Proof Shelter,.....facing page 46
Battery Brown,..... " " 48
" Meade,..... " " 50
Marsh Battery, or "Swamp Angel,"..... " " 52
Battery Rosecrans,..... " " 54
" Hays,..... " " 56
" Stevens,..... " " 58
Naval Battery,..... " " 60
Ten-Inch Parrott Rifle, (Battery Strong),..... " " 62
Gorge Wall, Fort Sumter, (four Views),..... " " 64
Head of Sap, Approaches to Fort Wagner,..... " " 70
Entrance to Bomb-Proof, Fort Wagner,..... " " 74
Fort Putnam, formerly Battery Gregg,..... " " 78

PLATES IN MAJOR BROOKS' REPORT. (*Not numbered.*)

Inclined Palisading and Boom. Figs. 1 to 5,.....facing page 232
Surf Battery, &c.,.... " 6 to 11,..... " " 234
Torpedo, Fig. 12 to 17,.....facing page 236
Mortar Platform. Iron Embrasure Lining. Figs. 18 to 22,. " " 252
Main Magazine, &c., Second Parallel,..... " 23 to 25,. " " 264
Splinter-Proof Shelters,..... " 26 to 31,. " " 264

PLATES IN COLONEL SERRELL'S REPORT.

PLATE
A. Details of Temporary Bridges or Wharves,.....facing page 266
B. Cutting off Piles under Water,..... " " 268
C. Temporary Floating Wharf,..... " " 272
D. The Marsh Battery, Preliminary Experiments,..... " " 278
E. Driving Sheet Piles of Marsh Battery,..... " " 280
F. Net Work to catch Floating Torpedoes,..... " " 286
G. Battery on Black Island,..... " " 288
H. Gun Carriage and Chassis,..... " " 288
I. Gun Carriage and Chassis,..... " " 288
K. Signal Tower,..... " " 290
L. Signal Tower,..... " " 290
M. Booms,..... " " 292
N. Booms,..... " " 292
O. Booms,..... " " 292

GEN. GILLMORE'S REPORT.

CHARLESTON, SOUTH CAROLINA.

1. The city of Charleston, South Carolina, is situated at the head of Charleston Harbor, on the point of a narrow peninsula formed by Ashley and Cooper Rivers. It is distant seven miles from the outer edge of the bar which stretches across the entrance to the harbor. This entrance is formed by Sullivan's Island on the north, and Morris Island on the south side; each about three and a half miles in length, low, narrow, and sandy, and each separated from the mainland adjacent to it by soft, deep, and impracticable marshes, varying in width from one and a half to three miles. These marshes are slightly above the level of ordinary high water, but are submerged by spring tides. They are traversed by numerous small streams or bayous, that are generally very narrow, deep, and tortuous. The inner ends of these islands reach to within three and a half to four miles from Charleston city. The harbor, inside of Morris and Sullivan's Islands, is bounded by the mainland on the north and by James Island on the south side. The

shortest distance across the channel between Sullivan and Morris Island is 2,700 yards.

FORTIFICATIONS IN CHARLESTON HARBOR BEFORE THE WAR.

2. The defences provided for the city of Charleston by the United States comprised the following works, viz.:

3. First, Fort Sumter, a strong casemated brick work of five faces, designed to mount two tiers of guns in embrasure and one *en barbette*. It is built on a shoal, its foundations being formed by stones *a perdue*. It is located on the south side of the channel, nearly equidistant from Sullivan and Morris Islands, and three and one-third miles distant from the nearest part of the city.

4. Its full armament, which it never received, would comprise about one hundred and thirty-five guns. None of the embrasures of the second tier had been finished at the commencement of the present war, and the openings left for them were walled up with brick during the occupancy of the work by Major Anderson's command in the spring of 1861, in which condition the enemy allowed them to remain. Its armament at that time comprised six 24-pounders, forty-one 32-pounders, ten 8-inch Rodman guns, ten 42-pounders, three 10-inch columbiads, and eight 8-inch sea-coast howitzers.

5. Second, Fort Moultrie, located on Sullivan's Island

at 1,700 yards' distance from Fort Sumter. It is a brick work mounting one tier of guns *en barbette*. Its armament in the autumn of 1860 consisted of sixteen 24-pounders, fourteen 32-pounders, ten 8-inch columbiads, five 8-inch sea-coast howitzers, and seven field-pieces.

6. Third, Castle Pinckney, an old-fashioned brick work on Shute's Folly Island, one mile east of the lower end of the city. Its armament at the opening of the war comprised fourteen 24-pounders, four 42-pounders, four 8-inch sea-coast howitzers, one 10-inch and one 8-inch mortar, and four light pieces for flank defence.

7. To the works above named, intended solely to resist a naval attack, the enemy commenced adding rapidly and largely when the war broke out.

8. Strong earthworks were erected on the upper and the lower ends, as well as at intermediate points, of both Morris and Sullivan's Islands.

9. The gorge wall of Fort Sumter was reinforced adjacent to the magazines, and its armament increased.*

10. Additional guns were mounted on Fort Moultrie, and it was otherwise very materially strengthened.

11. Old Fort Johnson, on James Island, was rebuilt and armed with a few heavy guns and mortars.

* See foot-note to paragraph 136.

12. Several batteries were also established on the shell beach running in a southeasterly direction from Fort Johnson.

13. Heavy guns were mounted upon the wharves of the city, and a number of iron-clad rams were constructed.

14. A work called Fort Ripley, mounting a heavy armament, was also improvised in the middle ground north of Fort Johnson.

15. Against a land attack formidable preparations were likewise made. On James Island a line of detached works, armed with heavy artillery, was constructed, fronting the Stono River, with its left resting on the village of Secessionville, and its right on James Island Creek, while Fort Pemberton, a strong and heavily armed earthwork, located at the junction of Wapoo Cut and Stono River, controlled the approach in that direction. Stono Inlet and Harbor were protected by an enclosed work on Coles Island, within short and effective range of the anchorage and all the landing-place inside the Stono bar.

16. Between Secessionville and Fort Johnson a long line of earthworks, armed with artillery, and looking toward Morris and Folly Islands, swept all the water approaches from that quarter.

17. In rear of the city of Charleston, formidable defences were also erected, covering the approach down the peninsula; but no very reliable information as to

their extent and strength had been obtained by us prior to the siege of Fort Sumter, which commenced early in July, 1863.

18. A line of heavily-armed entrenchments was also constructed, northeast of the city, on the mainland, extending from Wandoo River to Copahee Sound, to guard the approach from Bull's Bay.

19. The strength of the James Island works was tested by a bold but unsuccessful assault upon them by our forces under Brigadier-General Benham, on the 16th day of June, 1862.

20. A gallant attack upon Fort Sumter by our iron-clad fleet under Rear-Admiral Dupont, on the 7th day of April, 1863, was likewise unsuccessful. One of the iron-clads, the thin-armored Keokuk, was so much injured on that occasion that she subsequently sank abreast of Morris Island, and her armament fell into the hands of the enemy, while the others withdrew after an engagement of forty minutes, most of them being considerably disabled.

PLAN OF OPERATIONS.

The operations executed against the defences of Charleston comprised principally,

21. First, The descent upon the south end of Morris Island, and the capture of the enemy's fortified positions there, July 10th, 1863, including two co-operative feigned attacks elsewhere.

22. Second, Two unsuccessful assaults upon Fort Wagner on July 11th and 18th.

23. Third, The demolition of Fort Sumter by two bombardments, viz., from the 17th to the 23d of August, and from the 27th of October to the 9th of November.

24. Fourth, The siege and reduction of Forts Wagner and Gregg, ending September 7th.

25. Toward the close of May, 1863, I received orders to repair to the city of Washington. I there learned that it was the wish of the navy department to make another trial of the turret iron-clad gunboats against the defences of Charleston Harbor. My views, in regard to the part which could be efficiently taken in such an operation by the small land force then available for the purpose in that quarter, were requested. It was distinctly understood that no more troops could be sent to the department of the South.

26. I had entertained the opinion, which I freely expressed in my interviews with the secretary of war, the assistant secretary of the navy, and the general-in-chief, during which the subject was fully discussed, that Fort Sumter could be reached and reduced, or its offensive power entirely destroyed, without material, and perhaps without any, augmentation of the land and naval forces then serving in the department of the South; that a cordial and energetic co-operation between the two branches of service was essential to in-

sure the success of any plan of joint operations having in view the capture of Charleston city; and that the naval commander should be an officer who had confidence in the efficiency of the turret iron-clads, (*monitors*,) and their fitness to such work, and who was willing to risk his reputation in the development of their presumed, but comparatively unknown, though not unquestioned, powers. The operation was regarded as one requiring not only audacity but perseverance in its execution.

27. I also expressed the opinion that, beyond the capture of Morris Island and the demolition of Fort Sumter, the land forces, numbering scarcely eleven thousand men of all arms available for offensive operations, could not, unless largely reinforced, take the lead in any operations against the interior or land defences of Charleston, that would involve their leaving their hold upon the narrow sea islands, where, on the one hand, they had the co-operation of the navy against the iron-clad rams and gunboats of the enemy, and, on the other, practically impassable marshes, against which the well-known superior numbers of the enemy, and their facilities for concentrating troops by railroad, could be of little avail and confer no special advantage.

28. A land attack upon Charleston was not even discussed at any of the interviews to which I was invited, and was certainly never contemplated by me.*

* Major-General Halleck, general-in-chief, in his annual report

29. The principal question was, to what extent the fall of Sumter, or the destruction of its offensive power, would exert an influence on the capture of Charleston; that, of course, being the ultimate object in view.

says: "The withdrawal last year of most of our troops in South Carolina to reinforce General McClellan on the Peninsula compelled the commanding general of the department to confine himself mainly to the defence of the point which he then occupied. An attack upon Fort Sumter and Charleston had long been in contemplation by the navy department, and in March last it was represented that the operations of the iron-clads and monitors would be greatly facilitated by a land force prepared to assist the attack, and to occupy any work reduced by the navy.

"Accordingly General Foster, with a considerable force, and a large siege equipage which had been prepared for another purpose, was sent to assist in the naval attack. It was thought that his talents and experience as an engineer officer, and his personal knowledge of the localities and defensive works of Charleston Harbor, rendered him peculiarly suited for this duty; but not proving acceptable to the commanding general of the department, he was permitted to return to his command in North Carolina, leaving his troops and siege preparations in the department of the South. The naval attack on Fort Sumter took place on the 7th of April, but being unsuccessful, nothing apparently remained to be done by the land forces. A siege of Charleston and its defences by land had never been contemplated, and, therefore, was no part of the plan. It was now represented by the navy department that a second attack upon Fort Sumter and Charleston was preparing, and that its success required the military occupation of Morris Island and the establishment of land batteries on that island to assist in the reduction of Fort Sumter. The establishment of these batteries and the reduction of the enemy's works—Fort Wagner and Battery Gregg—being a matter of engineering skill, Brigadier-General, now Major-General Q. A. Gillmore, was selected to command the land forces engaged in these operations. In addition to being an educated and skilful military engineer, he had considerable experience

30. A consideration which possessed much weight in the deliberations, was, the great practical advantage to be derived from a blockade of Charleston Harbor in all respects thorough and complete. The capture of Morris Island, by allowing a portion or all of the blockading fleet to lie inside the bar, even should they fail to finally occupy the waters of the inner harbor, would secure this end.

in the special duties required in these operations. General Gillmore, despite the enemy's defensive works, landed his force on Morris Island on the 10th of July, and immediately commenced the slow and difficult operations of conducting the siege of Fort Wagner, and establishing batteries against Fort Sumter. Without, however, waiting for the reduction of the former, he opened, on the 17th of August, his fire on the latter, and on the 23d, after seven days' bombardment, Fort Sumter was reported a shapeless and harmless mass of ruins.

"Being under the fire of other forts of the enemy, inaccessible by land, our troops could not occupy it, and a few guns have since been temporarily remounted, but they have been as often silenced. General Gillmore now vigorously pushed forward his saps against Fort Wagner, and, on the morning of September 7th, took possession of that place, and also of Battery Gregg, most of the garrison having made their escape in boats during the night. He captured in all thirty-six pieces of artillery and a large amount of ammunition.

"General Gillmore's operations have been characterized by great professional skill and boldness. He has overcome difficulties almost unknown in modern sieges. Indeed, his operations on Morris Island constitute a new era in the science of engineering and gunnery. Since the capture of Forts Wagner and Gregg he has enlarged these works, and established powerful batteries which effectually command Fort Sumter, and can render efficient aid to any naval attack upon Charleston. They also control the entrance to the harbor."—*See General Halleck's Report, dated November* 15th, 1863.

31. The naval authorities at the seat of government regarded Fort Sumter as the key of the position. That stronghold once demolished, or its offensive power practically destroyed, the monitors and other iron-clads, they affirmed, could remove the channel obstructions, secure control of the entire harbor, and reach the city.

32. The barbette batteries of "Sumter" were specially dreaded, on account of their height above the water, and the comparative vulnerability of the monitors' decks to a plunging fire.

33. It was therefore determined to attempt the destruction of Fort Sumter, unless it should become necessary before the commencement of active operations, to detach troops from the department of the South to reinforce General Grant or General Banks, then operating on the Mississippi.

34. The following is a brief synopsis of the plan of attack agreed upon. Of the four distinct operations which it comprises, the army was to take the lead in executing the first, second, and third.

35. First, To make a descent upon and obtain possession of the south end of Morris Island, known to be occupied by the enemy, and then being strongly fortified by him offensively and defensively.

36. Second, To lay siege to and reduce Fort Wagner, a heavily armed earthwork of strong plan and relief, situated near the north end of Morris Island, and distant about 2,600 yards from Fort Sumter. With

Fort Wagner the work on Cummings Point would also fall.

37. Third, From the position thus secured to demolish Fort Sumter, and, afterwards, co-operate with the fleet, when it was ready to move in, by a heavy artillery fire.

38. Fourth, The monitors and iron-clads to enter, remove the channel obstructions, run by the batteries on James and Sullivan's Islands, and reach the city.

39. I received no written instructions whatever from the war department, everything connected with the operations of the land forces, in general and in detail, being left to my judgment and discretion. It was presumed that as soon as the fleet should reach the city, the outer line of defences thus broken through would be abandoned by the enemy; for, the control of Cooper and Wandoo Rivers by our gunboats, and the operations of the land forces which they could then aid and cover, would compel the evacuation of Sullivan's Island, after which the possession of James Island would be of but little value to the enemy.

40. Other plans of joint operations, to be executed after the navy should enter the inner harbor and reach the city, were subsequently from time to time discussed by Rear-Admiral Dahlgren and myself, which it is unnecessary to mention here.

41. Rear-Admiral Foote, an officer of tried bravery and long and successful experience, had, for the special

purposes of this contemplated attack, been assigned to the command of the South Atlantic blockading squadron, which included the naval force available for operations against Charleston. By his sudden death, the command devolved upon Rear-Admiral Dahlgren. He assumed command on the 6th of July, relieving Rear-Admiral Dupont.

42. I assumed command of the department of the South on June 12th. Our forces at that time had control of the coast from Lighthouse Inlet to St. Augustine, Florida, a distance of nearly two hundred and fifty miles. The positions actually occupied by our troops were, Folly Island, Seabrook Island, on the North Edisto, St. Helena Island, Port Royal Island, Hilton Head Island, Tybee Islands, Fort Pulaski, Ossabaw Island, Fort Clinch and Amelia Island, and the city of St. Augustine. An efficient blockading squadron lay off, or inside, the principal inlets.

43. Folly Island, the most northerly portion of the coast in our possession, was occupied by a brigade under Brigadier-General I. Vogdes, who had entrenched the position strongly, and had mounted several heavy guns on the south end of the island, to control the waters of Stono Harbor and Inlet, and the water approaches from James Island. A road had also been opened, practicable for infantry and artillery, by means of which a concealed communication with all parts of the island was secured.

44. A naval force under Commander Balch, comprising two gunboats and a mortar schooner, was stationed in the Stono and Folly Rivers, to co-operate against any possible attempt to dislodge us from Folly Island, and particularly to hold Stono River against the enemy's light-draft gunboats, that might approach by way of Wappo Cut, and Fort Pemberton.

45. The greater portion of Folly Island was very thickly wooded, the undergrowth being dense and almost impassable. Near the north end of the island, for a distance of nearly two thousand yards, it was extremely narrow, perfectly barren, and so low that the spring tides frequently sweep entirely over it. At the extreme north end, however, the sand ridges formed by the gradual action of the wind and tides, were, when our operations commenced, covered with a thick undergrowth, favorable for concealment and the masking of batteries. In this undergrowth General Vogdes had his pickets, those of the enemy being on the opposite side of Lighthouse Inlet, within musket range.

46. Cole's Island, and all the hommocks and patches of firm ground between Folly and James Islands, were kept under our surveillance by means of constant reconnoissances.

47. It was determined to withdraw the forces from Ossabaw Sound and the North Edisto, as positions of no importance to us, and of no advantage to the enemy, in consequence of the efficient blockade of those inlets by the navy.

48. By the changes above indicated, it was found that the aggregate means for carrying on offensive operations within the department, leaving the valuable depots at Hilton Head perfectly secure, and the other most important points reasonably so, comprised the forces enumerated below, viz.:

10,000 Effective Volunteer Infantry;
350 Volunteer Artillerists for serving heavy guns and guns of position;
600 Volunteer Engineer troops;
28 Pieces Field Artillery completely equipped and mounted;
8 Pieces Field Artillery without horses, and but partially manned;
5 Parrott Rifle Guns of eight inches diameter of bore, known as 200-pounders;
9 Parrott Rifle Guns of six and four-tenth inches diameter of bore, known as 100-pounders;
12 Thirty-pounder Parrott Siege Guns of four and two-tenth inches diameter of bore
4 Twenty-pounder Parrott Siege Guns of three and sixty-seven hundredth inches diameter of bore;
12 Thirteen-inch Sea-coast Mortars;*
10 Ten-inch Siege Mortars;
5 Eight-inch Siege Mortars;
3 Coehorn Mortars.

49. There were on hand a liberal supply of ammunition and engineering tools and materials. The entire

* The thirteen-inch sea-coast mortars were not used by us at all in our siege operations. Lighter mortars were used in the siege of Fort Wagner. Very little mortar fire was employed in the demolition of Fort Sumter, the siege of Fort Pulaski having satisfactorily demonstrated that for the reduction of casemated works of that character, at long ranges, mortars are not efficient, on account of the inaccuracy of their fire.

effective force in the department, including men on extra and daily duty, was 17,463 officers and men inclusive. No portion of the artillery was organized into a siege train.

50. As the endurance of the Parrott guns of heavy calibre was at that time a matter of some distrust and uncertainty, requisitions were sent forward for several more of them, which were promptly filled by the ordnance department.

PLAN OF PRELIMINARY ATTACK.

51. The project for obtaining a lodgment on Morris Island comprised three distinct operations:

First, The real attack from Folly Island, to partake of the nature of a surprise, more or less complete;

Second, A demonstration in force on James Island by way of the Stono River, designed to prevent reinforcements to the enemy on Morris Island from that quarter, and, if possible, draw a portion of the Morris Island garrison in that direction;

Third, The cutting of the Charleston and Savannah railroad at Jacksboro', by ascending the South Edisto River, in order to delay reinforcements from Savannah, should the real attack be temporarily checked or prematurely divulged.

52. The demonstration up the Stono was commanded by Brigadier-General A. H. Terry, and was eminently

successful. A part of the Morris Island garrison was drawn to James Island by it.

53. The attempt to cut the railroad between Charleston and Savannah was entrusted to Colonel Higginson, First South Carolina Volunteers, (colored,) who was sent from Brigadier-General R. Saxton's command at Beaufort for that purpose. It signally failed, with a loss to us of two pieces of field artillery, and a small steamer, which was burned to prevent its falling into the hands of the enemy.

DESCENT UPON MORRIS ISLAND, JULY 10, 1863.*

54. The storming of a fortified position, except when

* The question has been asked why the route across James Island from Stono River, the same that Brigadier-General Benham attempted, was not selected to operate upon.

The answer is simple. The enemy had more troops available for the defence of Charleston than we had for the attack. The general-in-chief, in the preliminary discussions of the project, had mentioned ten thousand men as the approximate number that could be collected in the department of the South for this operation. The force actually got together there did not vary much from eleven thousand five hundred men, including engineers and artillerists. Upon Morris Island, on account of its narrowness, this force was ample, and it was not until the command had been reduced one-third by sickness and casualties that reinforcements were asked for. But James Island presents a different case. There our progress would soon have been arrested by the concentration of a superior force in our front. Upon Morris Island both parties had all the force that could be employed with advantage. Our superiority in artillery, ashore and afloat—particularly in the use of mortars in the trenches—the

preceded by the slow operations of a regular siege, which, besides partially or entirely silencing the fire of the enemy's works, will also enable the attacking column to get very near the enemy under cover before the final assault is made, is always an operation attended with imminent peril in its execution, and great uncertainty in its results. The best troops can seldom be made to advance under the fire of even a few well-served pieces of artillery. The hazard of such an undertaking, great as it is under ordinary circumstances, when both parties operate on firm ground, becomes immeasurably augmented when the assaulting column has to approach in small boats from a distant point, exposed to full view and constant artillery fire, disembark and form upon an open beach in the presence of the enemy, and finally advance to the attack under the combined fire of artillery and small-arms.

55. Yet these were the difficult conditions of the problem so successfully solved in the descent upon Mor ris Island on the 10th day of July.

56. It was known from deserters and fugitives that the enemy had there in position from ten to twelve guns

successful application of new devices, the energy and skill of our engineers, and a steadily maintained initiative, gave us the controlling elements of success. Moreover, according to the programme of joint operations, the demolition of Fort Sumter was what the land forces had to accomplish, and that could be done with more ease and certainty from Morris Island than from any other position. James Island was too wide to operate upon, with a fair promise of success, with our small force.—Q. A. G.

of various calibres, and that these were so arranged in batteries of single pieces, that they each covered with their fire, not only the north end of Folly Island held by our advanced pickets, and the main ship-channel abreast of Morris Island, but could be so traversed as to sweep the entire length of Lighthouse Inlet, which separates the two islands.

57. Three methods of conducting the assault suggested themselves:

First, To place the men in small boats in Stono River, tow them out to sea, and land them in the surf at daybreak on the sea front of Morris Island;

Second, To accumulate on the north end of Folly Island the boats required for the assaulting column, keep them concealed there until the moment of attack, and then launch them under fire, embark the men, and cross over;

Third, To embark the men in Folly River, and pass in the night-time, during high tide, through the shallow creeks into Lighthouse Inlet and make the assault from that direction. This last-named method of attack was adopted.

58. In the mean time, between the middle of June and the 6th of July, ordnance and ordnance stores were quietly accumulated at Folly Island.

59. The following armament was secretly placed in position on the north end of Folly Island, completely

masked from the enemy's view by sand ridges and undergrowth. The object to be secured by this powerful array of guns was threefold, viz., First, To operate against and, if possible, dismount the enemy's guns nearest the place where the landing would have to be made; Second, To cover the debarkation of the troops; and, Third, To protect their retreat to the boats in case of repulse. This last-named condition was considered by far the most important of the three.

Battery.	No. of Guns.	Kind of Guns.
A	2	3-inch Field Rifle.
B	4	20-pounder Siege Parrott.
C	4	30-pounder Parrott.
D	6	10-inch Siege Mortar.
E	2	3-inch Field Rifle.
F	6	10-pounder Field Parrott.
G	8	30-pounder Parrott.
H	4	10-inch Siege Mortar.
I	6	3-inch Wiard Field Rifle.
K	5	8-inch Siege Mortar.

(See Plate II.)

60. The duty of constructing these batteries was assigned to Brigadier-General I. Vogdes. The task was by no means easy, and to its successful execution our subsequent triumphs were due in no small degree.

61. It was necessary that the attack on Morris Island should be a surprise in order to insure success. Secresy was therefore an essential element in the preparations. Most of the work on the batteries, and all the transportation to them, was accomplished at night, and in silence.

Moreover, all signs of work had to be carefully concealed by day. One fortunate circumstance favored these operations. A blockade-runner had been chased ashore just south of the entrance to Lighthouse Inlet, within point-blank range of our batteries, and while the enemy on Morris Island were industriously engaged in wrecking this vessel night and day, (an operation which we could easily have prevented,) our batteries were quietly and rapidly pushed forward to completion. They were ready to open fire on the 6th July.

62. The fact that forty-seven pieces of artillery, with two hundred rounds of ammunition for each gun, and provided with suitable parapets, splinter-proof shelters, and magazines, were secretly placed in battery in a position within speaking distance of the enemy's pickets, exposed to a flank and reverse view from their tall observatories on James Island, and to a flank view at pistol range from the wreck, furnishes by no means the least interesting and instructive incident of this campaign.

63. Meanwhile, during the week ending July 8th, additional troops, comprising Brigadier-General Terry's division, about four thousand strong, and Brigadier-General Strong's brigade, about two thousand five hundred strong, were quietly accumulated on Folly Island under cover of darkness.

64. The buoys at the entrance to Stono River, where the channel was narrow and crooked, with but five feet

of water at low tide, were lighted up at night, and all transports carrying troops were ordered to enter after dark, land their men, and depart before daylight in the morning. Sutlers' schooners were ordered away, and all appearance of preparations for offensive operations was carefully suppressed. Upon General Vogdes' defensive works on Folly Island a semblance of great activity was conspicuously displayed. Everything being in readiness, the following order was issued:

65. CONFIDENTIAL INSTRUCTIONS.

HEADQUARTERS DEPARTMENT OF THE SOUTH,
FOLLY ISLAND, July 8th, 1863.

I. An attack upon Morris Island will be made at the rising of the moon to-night, by Brigadier-General Strong's brigade of Brigadier-General Seymour's division. This force will be embarked in small boats immediately after sunset, and will pass through Folly Island Creek to and across Lighthouse Inlet.

A small detachment from this force will enter the creek to the west of Morris Island, and will land just north of the old lighthouse, seize the batteries there, and, if possible, turn them upon the enemy's encampment north of them. The main column will land from Lighthouse Inlet, carry the batteries on the south end of Morris Island, and advance to the support of the detachment above mentioned. Two regiments and some field artillery will be held in readiness on the extreme north end of Folly Island to be pushed over as reinforce-

ments. To this end General Strong will send his boats back as soon as he has disembarked his command.

II. At the same time General Terry, with all his division, except the One Hundredth New York Volunteers, will ascend the Stono River under convoy of the navy, and make a strong demonstration on James Island, but will not unnecessarily hazard any portion of his command. Perhaps one or two regiments only need be disembarked. These should be pushed forward as skirmishers under cover of the navy.

III. A naval force is expected to enter the main channel abreast of Morris Island, by or before sunrise to-morrow morning, to co-operate with the land forces.

IV. Should the night attack fail from any cause, the assaulting column will withdraw to Folly Island, sending their boats into Folly Island Creek. In that event the batteries on the north end of Folly Island will open at daybreak, or as soon thereafter as practicable.

Brigadier-General Seymour will arrange the details.

By order of

Brigadier-General Q. A. GILLMORE.

W. L. M. BURGER,

Assistant-Adjutant-General.

66. Colonel Serrell of the New York Volunteer Engineers had received orders to remove, before daybreak on the 9th, enough of the piles, which the enemy had previously placed across the creek which connects Light-

house Inlet with Folly Island Creek, to allow the column in the small boats to pass through.

67. The batteries on the north end of Folly Island were also ordered to be unmasked, by opening out the embrasures and cutting away the brushwood in front of them. (See Plate II.)

68. About midnight on the 8th it was determined, for various reasons, the principal one of which was the unseaworthy condition of our boats, to defer the attack until the next night. A sufficient number of piles had been removed to afford a passage for the boats, but the work of unmasking the batteries had not progressed far enough to expose them to the view, or attract the attention of the enemy.

69. In the mean time Brigadier-General Terry's command, of about three thousand eight hundred men, had proceeded up the Stono River on the afternoon of the 8th, and was confronting the enemy on the lower end of James Island. The immediate effect of this demonstration, as subsequently ascertained, was to draw off a portion of the enemy's force on Morris Island.

The following order was then issued on the afternoon of the 9th, and full detailed instructions for the assault given verbally to Generals Seymour and Strong.

65. CONFIDENTIAL INSTRUCTIONS.

HEADQUARTERS DEPARTMENT OF THE SOUTH,
FOLLY ISLAND, S. C., July 9th, 1863.

I. The attack on Morris Island, ordered for this

morning but postponed in consequence of the inclemency of the weather and other unfavorable circumstances, will take place to-morrow morning at break of day, by opening our batteries at the north end of Folly Island.

General Strong's brigade, or so much of it as the small boats can accommodate, will embark to-night and hold itself in Folly Island Creek, ready to move forward and at the proper time occupy the south end of Morris Island.

II. Lieutenant-Commanding Francis W. Bunce, United States Navy, with four navy howitzer launches, will approach Lighthouse Inlet at daybreak, by way of Folly Island Creek, and engage the enemy's rifle-pits and batteries on Morris Island in flank and reverse, choosing his own position. He will cover General Strong's landing.

III. Two regiments of infantry, a battery of light artillery, and five Requa's rifle batteries,* will be held in readiness to reinforce General Strong promptly.

Brigadier-General Seymour will arrange and order all details.

By order of

Brigadier-General Q. A. GILLMORE,

ED. W. SMITH,

Assistant-Adjutant-General.

* For a description of the Requa batteries see Report of Major T. B. Brooks, A. D. C. and Assistant Engineer.

71. In pursuance of the above order, nearly two thousand men of General Strong's brigade were embarked in small boats in Folly River on the evening of the 9th, and at daybreak on the following morning the head of the column had reached Lighthouse Inlet, where it was halted. The boats kept close to the east shore of the creek, and were screened by the marsh grass from the view of the enemy on Morris Island.

72. Our batteries on Folly Island opened shortly after daybreak, and were served rapidly for about two hours, when I ordered General Strong to land and make the assault by putting two regiments ashore at Oyster Point, and the balance of his command on the firm land lower down. The landing was promptly effected, under a hot fire of artillery and musketry, under which our troops did not falter for a moment. All the enemy's batteries on the south end of Morris Island were gallantly and successively carried.

73. By 9 o'clock A.M. we occupied three-fourths of the island, and our skirmishers were within musket range of Fort Wagner. The heat being intense, and the troops exhausted, offensive operations were suspended for the day.

74. Brigadier-General Seymour was ordered to carry Fort Wagner by assault at daybreak on the following morning. The attempt failed. The following report of these operations was made to the general-in-chief:

75. DEPARTMENT OF THE SOUTH,
HEADQUARTERS IN THE FIELD,
MORRIS ISLAND, July 12th, 1863.

Major-General H. W. HALLECK,

General-in-Chief U. S. Army, Washington, D. C.:

SIR,—I have the honor to report that at five o'clock on the morning of the 10th instant I made an attack upon the enemy's fortified positions on the south end of Morris Island, and, after an engagement lasting three hours and a quarter, captured all his strongholds on that part of the island, and pushed forward my infantry to within six hundred yards of Fort Wagner. We now hold all the island except about one mile on the north end, which includes Fort Wagner and a battery on Cummings Point, mounting, at the present time, fourteen or fifteen heavy guns in the aggregate. The assaulting column was gallantly led by Brigadier-General Strong. It landed from small boats, under cover of our batteries on Folly Island and four monitors led by Rear-Admiral Dahlgren, which entered the main channel abreast of Morris Island soon after our batteries opened.

The monitors continued their fire through the day, mostly against Fort Wagner.

On the morning of the 11th, at daybreak, an attempt was made to carry Fort Wagner by assault. The parapet was gained, but the supports recoiled under the fire to which they were exposed, and could not be got up. Our loss in both actions will not vary much from

one hundred and fifty men in killed, wounded, and missing.

We have taken eleven pieces of heavy ordnance, and a large quantity of camp equipage. The enemy's loss in killed, wounded, and missing, will not fall short of two hundred.

Very respectfully, your obedient servant,

Q. A. GILLMORE,

Brigadier-General-Commanding.

76. It was subsequently ascertained from deserters and prisoners that the enemy's loss was very considerably under-estimated in the above report. General Beauregard, in his official dispatch, admits a loss of three hundred, including sixteen commissioned officers, killed, wounded, and missing.

77. The kind and calibres of the guns captured in this assault are given in the following table, and their several positions are indicated on Plate II, by the capital letters as follows:

A	1	Eight-inch Navy Shell Gun. Pintle in centre transom.
B	1	Eight-inch Sea-coast Howitzer. Pintle in rear transom.
C	1	Three-inch Whitworth, Siege Carriage.
D	3	Ten-inch Sea-coast Mortar.
E	1	Thirty-pounder Parrott (Navy), Siege Carriage.
F	1	Brooks Rifle (Siege).
G	1	Eight-inch Navy Gun.
H	1	Eight-inch Navy Gun.
I	1	Eight-inch Sea-coast Howitzer.

78. Brigadier-General Terry was attacked on James

Island by a largely superior force,* including infantry, cavalry and artillery, on the 16th of July. With the aid of the gunboat Pawnee, Captain Balch, lying on General Terry's left, in the Stono, and two army transports, each carrying a small armament, and operating in the creek on his right, the enemy was repulsed. The demonstration in that quarter having accomplished its object, General Terry's command was withdrawn on the 17th of July.

79. The failure of the assault on Fort Wagner of July 11th, taken in connection with apparently trustworthy statements made by prisoners and deserters from the enemy, giving sundry details of the tracé and profile of that work, and the strength of its garrison and armament, induced me, upon conferring with Rear-Admiral Dahlgren, to establish counter batteries against it.

80. It was determined to attempt, with the combined fire of the land batteries and the gunboats, to dismount the principal guns of the work, and, either drive the enemy from it, or open the way to a successful assault. Batteries were accordingly established, and were ready to open fire on the morning of July 18th.

81. Up to this period our actual knowledge of the strength of the enemy's defences on the north end of Morris Island was in some degree contradictory and quite meagre. It was *known* that Fort Wagner was an enclosed work, reaching from high water mark on the

* See foot-note to paragraph 54.

east side, to Vincent's Creek on the west side of the island. It was *thought* that it mounted ten or twelve guns; that four or five of them were on the south front to protect the land approach, and that two, or perhaps three, heavy guns covered the main ship channel abreast of the island. Battery Gregg, on Cummings Point, was *supposed* to mount two or three heavy guns, for channel defence only.

82. The truly formidable character of the armament of Fort Wagner, its hidden resources, and the great strength and capacity of its bomb-proof shelter, could not yet be fully developed, for a comprehensive and reliable estimate of its powers, whether those of resistance or of positive offense. The nature of its construction demanded and enticed an actual attempt upon the work, to make manifest its real and concealed elements of strength. Moreover, it was not known, until subsequently, that the island at its narrowest point, near and just south of Fort Wagner, had been reduced by the encroachments of the sea to about one-fourth or one-third of the width shown on the latest coast survey charts, and that during spring tide and heavy weather, the waves frequently swept entirely over it, practically isolating that part of the island defended by Fort Wagner and Battery Gregg, thus greatly augmenting the difficulties to be overcome in capturing the position, whether by assault or by gradual approaches.

83. HEADQUARTERS DEPARTMENT OF THE SOUTH,
IN THE FIELD, MORRIS ISLAND, July 17, 1863.

Special Orders.
No. 9.

The several batteries against the enemy's positions on the north end of Morris Island are named as follows:

I. Battery Reynolds in advance, comprising five 8-inch siege mortars, two 30-pounder and six 10-pounder Parrott rifles, four 3-inch rifles, and two Wiard rifles.

II. Battery Weed; in rear of right of Battery Reynolds, comprising four 10-inch siege mortars.

III. Battery Hays; in rear and on the left of Battery Reynolds, comprising nine 30-pounder and four 20-pounder Parrott rifles.

IV. Battery O'Rourke; in rear of the right of Battery Hays, comprising five 10-inch siege mortars. Captain Langdon, First United States Artillery, is assigned to the command of Batteries Reynolds and Weed. Lieutenant-Colonel Jackson, Assistant Inspector-General, with Major Bailey, Third Rhode Island Artillery, as assistant, is assigned to the command of Batteries Hays and O'Rourke.

These batteries will be opened upon Fort Wagner immediately after break of day to-morrow. The firing must be executed with great care and deliberation. The object of the rifled guns being principally to dismount the enemy's guns, they will not expend ammunition when their view of the enemy's works is obstructed

by smoke. Both time-fuze and percussion shells will be used, preferably the former. Each mortar will fire once every five minutes, alternating from the right in each battery. The shells should be exploded in or directly over Fort Wagner.

By order of

Brigadier-General Q. A. GILLMORE.

EDWD. W. SMITH,

Assistant-Adjutant-General.

84. The distances of these several batteries from Fort Wagner were as follows: Battery Reynolds, 1,330 yards; Battery Weed, 1,460 yards; Battery Hays, 1,830 yards; and Battery O'Rourke, 1,920 yards.*

CHARACTERISTIC PHYSICAL FEATURES OF MORRIS ISLAND.

85. Morris Island is about three and three-quarters miles long. Its width, above high water mark, varies between very wide limits, (twenty-five to one thousand

* Subsequently to this period, and through all the most important operations of the season, the Commanding General performed the duties of Chief Engineer. Colonel J. W. Turner was made Chief of Artillery, in addition to his duties as Chief of Staff. Surgeon H. R. Wirtz became Medical Director, and Captain Alfred Mordecai, Chief of Ordnance. Colonel E. W. Serrell, New York Volunteer Engineers, Captain (now Major) T. B. Brooks, Aid-de-camp, and Lieutenants Suter and Mickie, United States Engineers, were appointed Assistant Engineers. Captain Reese joined the command a few days before the fall of Fort Wagner, and was appointed Assistant and Consulting Engineer.

yards,) while its area is four hundred acres, approximately.

86. The centre of the island lies in a southeasterly direction from Charleston city, and is five and three-eighths miles distant from it.

87. Cummings Point, the northern extremity of the island, is exactly 6,616 yards distant from the nearest point of the city, and 2,700 yards distant by the shortest line from Fort Moultrie on Sullivan's Island. Fort Sumter is 1,390 yards distant from Cummings Point.

88. Morris Island is widest at its southern extremity, where it is made up of a succession of irregular sand hills and ridges, the highest of which rise to a uniform height of thirty-six feet above ordinary high water level, while just south of Fort Wagner the width is reduced to twenty-five yards, and the depth to two feet. At this point the sea frequently breaks entirely over the island during the spring tides. On the east side it is gradually yielding to the encroachments of the sea.

89. During the first fifty days of our occupation, the loss in many places was one foot a day, while between Fort Wagner and Battery Reynolds, seventy-five yards in width have been lost since the last charts by the United States coast survey were prepared and published.

90. The stratum of mud of which the salt marsh separating James and Morris Islands is composed, passes under the latter, and crops out on the beach between high and low water mark. The island, in fact, is sim-

ply an irregular mass of sand, which the continued action of wind and sea (particularly the former) has accumulated upon the bosom of the marsh.

91. The material of which Morris Island is formed, and with which the batteries, trenches and other siege works were constructed, is a fine and almost white quartz sand, weighing, when dry, eighty-six pounds to the cubic foot.

92. Twenty-four pounds (about three gallons) of water will saturate one cubic foot of this sand, which is thereby decreased in volume about five per cent. Its power of resisting the penetration of shot is also decreased by wetting, while a steady and gradual pressure, like the moving of heavy wheels over it, produces a greater effect, by at least three-fold, upon the dry than upon the wet sand.

93. During the first week of our occupation of Morris Island, a succession of heavy rain storms very materially interfered with the progress of our works. Nearly all the batteries were submerged, and much of the powder spoiled, so that the combined attack on Fort Wagner, fixed to take place on the 16th of July, was delayed until the 18th; and finally, instead of commencing at the break of day, as had been intended, was necessarily postponed until noon. Advantage was taken of this unavoidable delay to obtain the ranges of our mortars.

94. Soon after mid-day (July 18th) all our batteries

opened, and the navy, which had been awaiting their completion, closed in opposite Fort Wagner, and took a very active and efficient part in the engagement.

95. In a short time the fort was entirely silent on the face fronting the land batteries, and practically so on the sea front, from which, at the commencement of the action, a sharp and severe fire had been delivered against the fleet.

ASSAULT OF FORT WAGNER, JULY 18, 1863.

96. Late in the afternoon I advised Rear-Admiral Dahlgren that I intended to storm the work about sunset. The time of twilight was selected for the storming party to move to the attack, in order that it might not be distinctly seen from the James Island and the Sullivan's Island batteries, and from Fort Sumter. Brigadier-General T. Seymour commanded the assaulting column, fixed its organization and formation, and was charged with the arrangement of the details for the attack.

97. Brigadier-General Strong's brigade led the assault. It was composed of the Fifty-fourth Massachusetts regiment, (colored,) Colonel Shaw, which was in advance; the Sixth Connecticut regiment, Colonel Chatfield; a battalion of the Seventh Connecticut regiment; the Forty-eighth New York regiment, Colonel Barton; the Third New Hampshire regiment, Colonel Jackson; the Ninth Maine regiment, Colonel Emery; and the

Seventy-sixth Pennsylvania regiment, Colonel Strawbridge; and was supported by Colonel Putnam's brigade, comprising his own regiment, (the Seventh New Hampshire,) Lieutenant-Colonel Abbot; the One Hundredth New York regiment, Colonel Dandy; the Sixty-second Ohio regiment, Colonel Pond; and the Sixty-seventh Ohio regiment, Colonel Voris. The regiments were all small in numbers.

98. As the head of the column debouched from the first parallel the guns in "Wagner," "Gregg," and "Sumter," and also those on James and Sullivan's Islands, opened upon it rapidly and simultaneously, and when it approached so near the work that the fire from the navy and from our own mortars, and the gun batteries on our extreme left, had to be suspended for fear of hitting our own men, then a compact and most destructive musketry fire was instantly poured upon the advancing column from the parapet, by the garrison of the work, which up to that moment had remained within the safe protection of the bomb-proof shelter, and now emerged therefrom to meet the exigencies of the assault.

99. The troops, however, went gallantly on, and although the leading regiment was soon thrown into a state of great disorder, which reacted disadvantageously upon, and delayed the progress of those which followed, and rendered it necessary to send in the supporting brigade, the southeast bastion was gained and held by us for nearly three hours. The advantage which the

darkness, and a perfect knowledge of the interior arrangements of the work gave the enemy, rendered it necessary for us to relinquish our hold upon it.

100. Our loss was very severe, especially in valuable officers of rank. Among the latter, who were either killed upon the spot or died subsequently of their wounds, were Brigadier-General George C. Strong and Colonels John L. Chatfield, Haldimand S. Putnam, and Robert G. Shaw. Brigadier-General Seymour and several regimental commanders were severely wounded. The behavior of the troops, under the circumstances, was unexceptionable, particularly that of the commanding officers.

SIEGE OF FORT WAGNER AND FIRST BOMBARDMENT OF FORT SUMTER.

101. The formidable strength of Fort Wagner, considered with regard to its position, tracé, armament, and interior arrangements, as developed in the unsuccessful assault of the 18th of July, induced a modification of the plan of operations, or, rather, a change in the order previously determined upon.

102. The demolition of Fort Sumter was the object in view, as necessarily preliminary, it was supposed, to the entrance of the iron-clads. Neither Fort Wagner nor Battery Gregg possessed any special importance as a defence against the passage of the iron-clad fleet. They were simple outposts of Fort Sumter. Fort Wag-

ner, in particular, was specially designed to prevent the erection of breaching batteries against that work. It was valueless to the enemy if it failed to accomplish that end, for the fleet, in entering, was not obliged to go within effective range of its guns.

103. To save valuable time, it was determined to attempt the demolition of Fort Sumter from ground already in our possession, so that the iron-clads could, with as little delay as possible, enter upon the execution of their part of the joint programme.

104. Should the fleet fail of achieving success in the inner harbor, the possession of all of Morris Island would then be of value to us as a means of securing a more perfect blockade of the port.

Arrangements also to press the siege of Fort Wagner by regular approaches were therefore made, although the obstacles to be removed, and the difficulties to be overcome, appeared most formidable.

105. Fort Wagner was an enclosed work, and occupied the entire breadth of the island, extending from high-water mark on the east, to Vincent's Creek and the impassable marshes on the west, presenting to us a front of over three times the average development that could, by taking advantage of all the available firm ground, be given to the head of our approaches. As we neared the work this ratio reached as high as ten to one. Its faces were mutually defensive, and were completely and thoroughly flanked. It had an excellent command, and

a bold relief. It was provided with a sluice-gate for retaining the high tides in the ditch. It was constructed of compact sand, upon which the heaviest projectiles produce but little effect, and in which damages could be easily and speedily repaired. It was known to contain a secure and capacious bomb-proof shelter for its entire garrison, and to be armed with between fifteen and twenty guns, of various calibres, nearly all bearing upon and completely covering the only approach to it, which was over a shallow and shifting beach, of scarcely half a company front in width in many places, subject to frequent overflow by the tides, and swept by the guns of not only Fort Wagner itself, but of Battery Gregg, Fort Sumter, and several heavily-armed batteries on James Island. It was seen both in flank and reverse by numerous heavily-armed batteries of the enemy. Its communication with Charleston being in the hands of the enemy, and entirely practicable to him during the night-time, its armament and garrison could be easily maintained at the maximum standard of strength and efficiency.

106. Against the formidable direct and flank fires to which the approaches to it would be exposed from the batteries which covered and protected Fort Wagner, we could expect to effect nothing, except, possibly, the demolition of Fort Sumter, which from its barbette guns could deliver, and had delivered, over both "Wagner" and "Gregg," an accurate and destructive fire.

107. The early elimination of Fort Sumter from the conflict, considered simply as auxiliary to the reduction of Fort Wagner, was therefore greatly to be desired, and arrangements were at once commenced, and the necessary orders given, to place the breaching guns in position.

108. At this state of the siege it became necessary to subdivide the engineering operations, civil and military, and assign to each assistant engineer a definite and specified field of labor.

109. Colonel E. W. Serrell, New York Volunteer Engineers, in addition to his duties as regimental commander, was charged with the construction of wharves in Lighthouse Inlet on Morris and Folly Islands, with certain projected fortifications on Black Island, and with the erection of a battery in the marsh between Morris and James Islands, to be used against Charleston city. To Major T. B. Brooks, Aid-de-camp, was intrusted the direction of the engineering operations on the right, comprising the approaches to Fort Wagner, and the construction of such batteries, magazines, defensive arrangements, &c., as might be required in that quarter. First Lieutenant Charles R. Suter, Corps of Engineers, was charged with the construction of a depot powder magazine and other duties. Lieutenant Michie, United States Engineers, had general charge on the left of all engineering operations there.

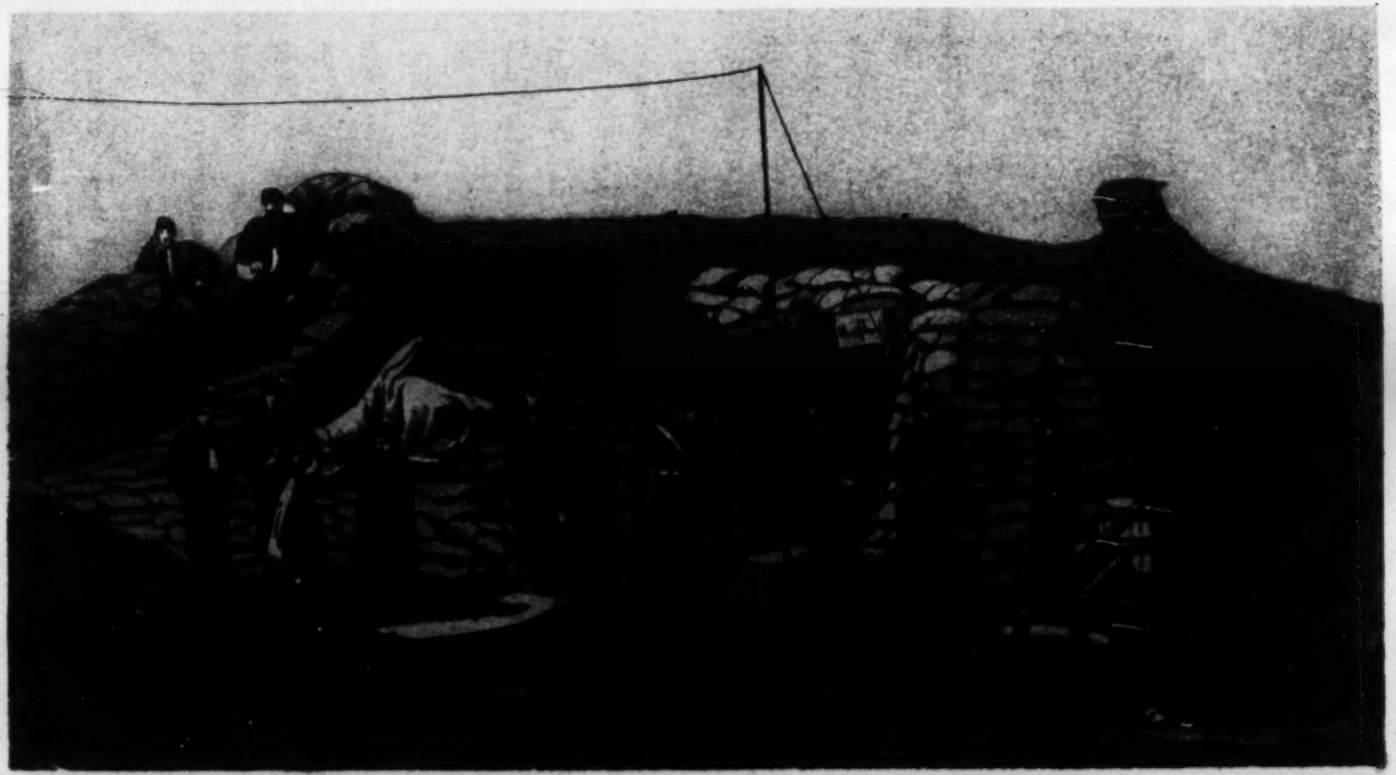
FIRST PARALLEL.

110. On July 18th, immediately after our second repulse at Fort Wagner, orders were given to convert the position occupied by our right batteries on that day, and named Battery Reynolds, into a strong defensive line, capable of resisting a formidable sortie. From that time this line took the name of the First Parallel, in our operations against Fort Wagner.

111. A row of inclined palisading, reaching entirely across the island, was planted about two hundred yards in advance of the line, with a return of fifty yards on the right. This return was well flanked by two guns on the right of the parallel. The parapet between the guns was arranged for infantry defence; a bomb-proof magazine was constructed, and the armament of the line modified and increased, so that the parallel contained eight siege and field guns, ten siege mortars, and three Requa rifle batteries.* These works were all completed by the 23d July.

112. July 21st, I directed an emplacement for one 8-inch Parrott rifle to be prepared next the marsh on our left, and to the rear of the first parallel. It was to be used against Fort Sumter, and its distance from that work was 4,200 yards. Major Brooks was charged with this work.

* For a description of the Requa batteries, see Report of Major T. B. Brooks.



D Van Nostrand, Publisher.

J Bien, Lith.

SPLINTER-PROOF SHELTER

For Field Officer of the day and Stretcher Corps in 2d Parallel, Torpedo near the entrance Approaches to Fort Wagner.

SECOND PARALLEL.

113. July 23d.—On the night of the 23d the second parallel was established by the flying sap, about six hundred yards in advance of the first, upon a line running diagonally across the island, in a direction approximately northwest and southeast, by taking advantage of a narrow ridge which stretched across the island at that point, and extended some distance into the marsh. The end of this ridge on the left rested boldly on Vincent's Creek, with marshy ground in its front.

114. It being the intention to place, directly in rear of the second parallel, as many breaching guns against Fort Sumter as the place would accommodate, provided it should be found practicable to establish them there under the concentrated fire to which the position was exposed, orders were issued to give to its defensive arrangements the most formidable character of which the position was capable.

115. The creek on the left was spanned by two booms of floating timber, to keep off sorties from boats; an obstacle consisting of abattis, inclined palisading, and wire entanglements, was placed several yards in advance, with its left resting on the creek, and with a return on the right perfectly flanked by six light guns in the parallel. On the right, the parallel itself was extended by a defensive barricade to low water mark, terminating at that point in a strong crib work, on

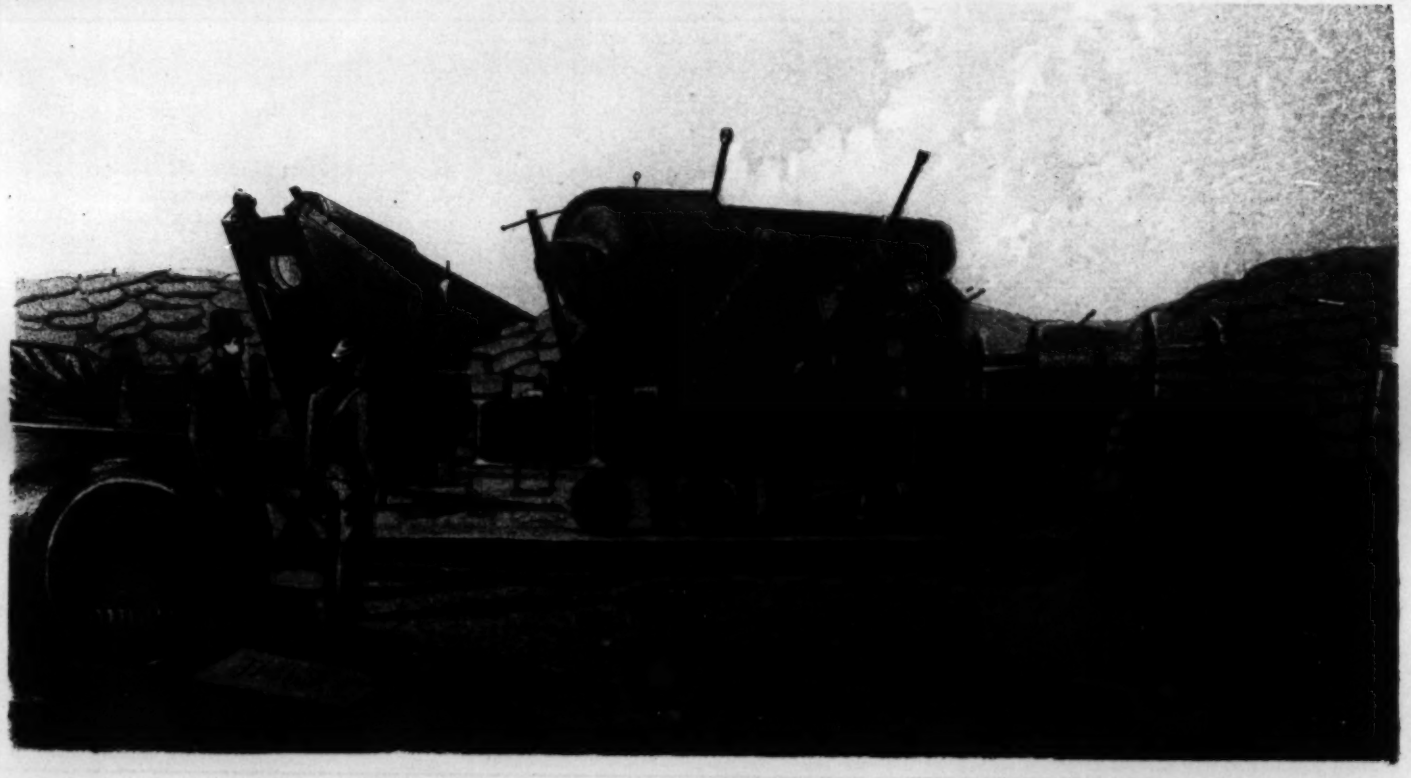
which was placed three Requa batteries and two field howitzers, to sweep the breach. This was called the "Surf Battery," and was a novel, interesting, and not unimportant feature of that portion of our approaches. (See Report of Major Brooks.)

116. July 26th.—Directed breaching batteries against Fort Sumter to be established in the second parallel.

117. Major Brooks, Aid-de-camp and Assistant Engineer, upon whom this duty devolved, although entertaining and expressing pretty decided opinions of the impracticability of such an undertaking, under the heavy direct and flank fires to which the fatigue parties would be exposed, nevertheless entered zealously upon the work.

118. No serious difficulty in executing the appropriate work of the engineers in this operation was apprehended, but in the slow and tedious labor of moving into position and mounting the heavy guns and carriages, under a constant and severe fire from the front and one flank, it was greatly feared that we would not only lose many valuable lives, but that the gun-carriages, as well as the sling-carts, gins, and other appliances necessary for such work, would be destroyed by the enemy's fire. It seemed probable that the enemy would detect, and use every means to frustrate, the execution of such an important part of our plan.

119. The work was successfully accomplished, however, with unusual rapidity, and without serious loss.



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J. Bien, Lith.

BATTERY BROWN.

Two 8-inch Parrott Rifles, wrought iron reinforce in foreground; breach blown out; top carriage and gun thrown forward on the parapet.

The transportation to these batteries, and the labor of mounting the carriages and guns, could be performed during the night-time only. The working parties were subjected to a continuous and at times a very severe fire.

120. The defensive arrangements of the second parallel were, for all practical purposes, completed by the 26th of July, and comprised, besides the formidable obstacle in front of it, already referred to, two hundred and ninety lineal yards of parapet, arranged for infantry fire, and twenty-one pieces of light artillery. It also contained three 30-pounder Parrott rifles, and one Wiard field gun, to be used against Fort Wagner and Battery Gregg. The line was considered as strong against open assault as Fort Wagner itself, although requiring, on account of its greater length, a larger force for its perfect defence.

121. The breaching batteries against Fort Sumter located in this parallel contained two 8-inch Parrott rifles and five 100-pounder Parrott rifles. They were located at a mean distance of 3,525 yards from Fort Sumter, and were in readiness to open fire on the 15th of August.

122. In the mean time Colonel Serrell had been ordered, on the 25th July, to establish a breaching battery in the first parallel, to be armed with two 200-pounder Parrott rifles and two 80-pounder Whitworth rifles. The use of these guns, and the services of a de-

tachment of men to man them, had been kindly offered by Admiral Dahlgren. The battery was called the "Naval Battery," and was under the efficient command of Captain Foxhall A. Parker, United States Navy, throughout the bombardment, which commenced on the 17th and ended on the 23d day of August.

123. July 27th. Directed Lieutenant Michie to commence the construction of breaching batteries against Fort Sumter on the sand ridges to the left and rear of the "beacon house," near the marsh. The work on these batteries was pushed forward rapidly under the fire of the James Island batteries.

124. A 10-inch Parrott rifle (300-pounder) having arrived from the north, (the only one used by us in our operations prior to the capture of Fort Wagner,) it was decided to place it on the left, with a view to its security from the enemy's fire. The duty of preparing a position for it was assigned to Lieutenant Michie.

125. The breaching batteries established in this locality were at a mean distance of 4,300 yards from Fort Sumter, and comprised one 10-inch Parrott rifle, (300-pounder;) two 8-inch Parrott rifles, (200-pounders;) and four 100-pounder Parrott rifles. All these pieces took an effective part in the first bombardment of Fort Sumter from the 17th to the 23d of August, although some of them did not open until the second, and others not until the third day.

126. August 2d. Between the 15th and 20th of July

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BATTERY MEADE

Two 100 pounder Parrot Rifles, Breaching Battery against Sumter
3428 yards distant.

Colonel Serrell, New York Volunteer Engineers, and Lieutenant Michie, United States Corps of Engineers, had made several examinations of the marsh to the westward of Morris Island, in order to determine the practicability of placing a battery there, within effective range of the city of Charleston and the shipping at the wharves.

127. This marsh, like other salt marshes on this coast, consists of a bed of soft, black mud, from sixteen to eighteen feet in depth, overgrown with reeds and grass, traversed by numerous deep and tortuous *bayous*, and subject to daily overflow by the tides.

128. The difficulties which presented themselves, viewing the undertaking as simply an attempt to solve a complicated problem in practical civil engineering, appeared very great, leaving out of the question the severe artillery fire to which the working parties would be exposed, without the possibility of securing any protection, until the battery should be nearly completed.

129. The experience in the marshes on the Savannah River above Fort Pulaski, in the investment of that work in 1862, came to our aid, and contributed largely to the speedy and successful completion of the work.

130. A number of experiments to ascertain the sustaining power of the marsh mud were made, and, from the data thus obtained, a plan of a battery for one 8-inch Parrott rifle was prepared, and Colonel Serrell was charged with the construction of the work.

131. It was located at a point nearly midway between Morris and James Islands, 7,000 yards distant from the lower end of Charleston city, and was named the "Marsh Battery," although it is generally known as the "Swamp Angel," a name conferred upon it by the soldiers. A deep creek directly in front of the battery, across which a strong boom was constructed a few yards lower down, rendered the position secure against attack from infantry or boat parties.

132. The "Marsh Battery" consisted of a sand-bag parapet, with a return, or epaulement, of the same material, at each end; the whole supported by a broad grillage, composed of round timbers in two layers, crossing each other at right angles, and resting directly on the surface of the marsh. In this grillage, in rear of the parapet, there was a rectangular opening through both layers of logs, exactly of the proper size to receive the platform of the gun, and surrounded by closely-fitting sheathing piles. These piles reached from the upper surface of the grillage entirely through the stratum of mud into the solid substratum of sand. Within this rectangular space, thus closely confined laterally by the piles, layers of marsh grass, canvas, and sand, were placed directly on the mud, to the aggregate depth of several inches, the sand being on top. On the sand rested a compact sub-platform of planks. On these planks the gun platform was placed.

133. The epaulement and the gun were therefore so

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MARSH BATTERY, OR "SWAMP ANGEL."

After bursting Gun thrown forward on parapet Carriage & Chassis have been removed Gun bursted at the 36th round
Used against Charleston. 7000 yards distant to nearest point.

far independent of each other, that the subsidence or displacement of the one would not necessarily involve that of the other. This battery was completed and in readiness to open fire on the 21st August. (For a detailed description see Report of Colonel Serrell.)

134. August 9th. On the 9th of August Major Brooks was directed to establish the third parallel, with the flying sap, about 330 yards in advance of the right of the second parallel, and also to commence the approaches between the two parallels, by the same method.

135. From this period forward, the fire from the James Island batteries, from "Wagner," "Gregg," and "Sumter," and especially from the enemy's sharpshooters in Fort Wagner, was severe and almost unceasing. Indeed on the 10th our advance was stopped entirely by it, and it became a question of grave doubt whether we could push forward our trenches much farther with the advantages to all appearance so entirely on the side of the enemy.

136. Meanwhile the garrison of Fort Sumter was industriously engaged in strengthening its passive means of defence. Sand bags were piled up against the gorge wall on the outside, the sand bag and cotton bale filling of the gorge casemates was greatly added to, the traverses on the terre-plain were enlarged, and cotton bales suspended from the coping as a protection to the para-

pet. The cotton bale protection on the outside was afterwards abandoned.*

137. At this period of the siege it was not supposed that it would be necessary to sap entirely up to Fort Wagner, in order to insure its capture; for on the presumption that Fort Sumter would be demolished from positions which we then held, it was considered probable that a complete investment of Morris Island at night, could be established and maintained by picket boats. Our batteries stopped the enemy's communication with the island by day.

138. An attempt to illuminate the waters near Cummings Point, with calcium lights placed in the left batteries, was but partially successful, as the distance (over 3,000 yards) was too great for the apparatus which we had. The idea was to throw a cone of light upon the water approach, and station the guard boats in the ob-

* As soon as the enemy obtained possession of Fort Sumter, in April, 1861, he adopted means to secure the magazines near the angles of the gorge (see M M M M, Fig. 1, Pl. V.) against the effects of breaching batteries, by erecting against the exterior face of the gorge wall, opposite the magazine, a mass of solid masonry from 10 to 12 feet in thickness. The portions of the gorge wall thus protected are represented by the dotted lines a, b, c, d, and a′, b′, c′, d′, Fig. 5, Pl. V.

A few days after the United States forces made a lodgment on Morris Island, July 10th, 1863, the enemy commenced piling sand bags against the gorge wall on the outside. The general outline of this covering when our breaching batteries opened on the work, August 17th, is represented by the dotted line e, f, g, h, i, j, Fig. 5, Pl. V.

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BATTERY ROSECRANS.

Bursted 100 pounder Parrott, 3447 yards from Fort Sumter, gun remained on the chassis.

security just outside the lateral limits of the cone. The plan, I am convinced, was entirely practicable, and with powerful reflectors, and an efficient picket boat organization, would have given decisive results.

139. It was decided not to push the sap toward Fort Wagner beyond the third parallel, until the fire upon Fort Sumter had been opened.

140. My communication to the general-in-chief of August 10th is as follows:

HEADQUARTERS DEPARTMENT OF THE SOUTH,
MORRIS ISLAND, S. C., August 10th, 1863.

Major-General H. W. HALLECK,

General-in-Chief U. S. A., Washington, D. C.:

SIR,—I have to acknowledge the receipt of your communication of the 28th ultimo, in answer to my request for reinforcements.

The unexpected reduction of my effective force by sickness, was, at the time I wrote, quite alarming. I admit that I had not taken into consideration the probable effect of the resumption of active operations upon men that had been idle for an entire year. It has in truth acted like a process of re-acclimation. All but two regiments of the forces ordered from Major-General Foster's department are here.

If my command continues to improve in health, I shall require no more men than I now have to accomplish the reduction of Fort Sumter. After that is done, the monitors must take the lead, in accordance with the

project which was discussed and informally adopted when I left Washington.

General Beauregard has for the defence of Charleston twice as many men, and more than five times as much artillery, as I have.

I therefore beg the department not to lose sight of the fact, that after the gate is opened to the monitors and iron-clads by the reduction of Fort Sumter, the army here, so long as it remains greatly inferior in numbers to that of the enemy, must remain defensively upon these sea islands.

My operations are progressing satisfactorily. I expect to open a heavy fire on Fort Sumter on the 14th instant.

Very respectfully, your obedient servant,

Q. A. GILLMORE,

Brigadier-General-Commanding.

141. On the 16th August, I wrote to the general-in-chief as follows:

HEADQUARTERS DEPARTMENT OF THE SOUTH,
MORRIS ISLAND, S. C., August 16, 1863.

Major-General H. W. HALLECK,

General-in-Chief U. S. A., Washington, D. C.:

SIR,—I have to report a steady progress in our operations here. In consequence of the inferior and irregular quality of the only powder in this department suitable for heavy guns, a fact which was not suspected

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BATTERY HAYS.

One 8 inch Parrott Rifle dismounted breaching battery against Sumter 4172 yards distant, Sumter & Gregg in the distance.

by my ordnance officer, until developed by our preliminary practice after the magazines had been filled, I was unable to open my batteries on the 14th, agreeably to my expectations, as stated in my letter of the 10th inst.

I have borrowed some powder from the navy, which (with some recently arrived from the North) will enable me to open to-morrow, the 17th inst.

Two monitors, with one rifled gun each, are expected to co-operate with me against Sumter, at a distance of about 2,000 yards. Two others will remain abreast of Fort Wagner, to keep down its fire.

Very respectfully, your obedient servant,

Q. A. GILLMORE,

Brigadier-General-Commanding.

142. A sufficient number of breaching guns being in readiness on the 16th of August, to warrant our opening fire upon Fort Sumter, and arrangements having been made with Admiral Dahlgren to assist in subduing the fire of Battery Gregg and Fort Wagner, particularly that of the sharpshooters in the latter, from which we apprehended considerable annoyance to our breaching batteries in the second parallel, the following order was issued:

143

DEPARTMENT OF THE SOUTH,
HEADQUARTERS IN THE FIELD,
MORRIS ISLAND, S. C., August 16, 1863.

Special Orders. No. 481.

I. All the breaching batteries established against Fort

Sumter, that are completed and in condition for efficient service, and the other batteries herein below named, will be opened at the break of day to-morrow.

Those in process of construction will commence firing as soon as the several pieces in succession are ready to open effectively. The firing will continue from day to day, under the immediate supervision of the chief of artillery, commencing at daybreak and ending at dusk in the evening, with such intermission during the heat of the day as may from time to time be ordered, as follows:

First. Battery Brown; Captain C. G. Strahan, Third Rhode Island Volunteer Artillery, commanding; comprising two 8-inch Parrott rifles; against the gorge wall of Fort Sumter, one piece firing shot and the other percussion shells exclusively.

Second. Battery Rosecrans; Captain J. J. Comstock, Jr., Third Rhode Island Volunteer Artillery, commanding; comprising three 100-pounder Parrott rifles; against the gorge wall of Fort Sumter, one piece to fire percussion shells, and two pieces to fire shot, exclusively.

Third. Battery Meade; First Lieutenant Henry Holbrook, Third Rhode Island Volunteer Artillery, commanding; comprising two 100-pounder Parrott rifles; against the gorge wall of Fort Sumter, both pieces firing percussion shells exclusively.

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BATTERY STEVENS

Two 100 pounder Parrot Rifles, Breaching Battery against Sumter,
4278 yards distant.

Fourth. Battery Kearney; First Lieutenant S. S. Atwell, Seventh Connecticut Volunteer Infantry, commanding; comprising three 30-pounder Parrott rifles, and three Coehorn mortars. The guns will operate against Battery Gregg with shot and shell, unless otherwise directed, and the mortars against Fort Wagner, exploding the shell just over the fort.

Fifth. "The Naval Battery;" Commander F. A. Parker, United States Navy, commanding; comprising two 8-inch Parrott rifles and two 80-pounder Whitworth rifles; against the gorge wall and barbette fire of Fort Sumter, at the discretion of the battery commander.

Sixth. Battery Reynolds; Captain A. E. Green, Third Rhode Island Volunteer Artillery, commanding; comprising five 10-inch siege mortars; against Fort Wagner, exploding the shells just before striking.

Seventh. Battery Weed; Captain B. F. Skinner, Seventh Connecticut Volunteer Infantry, commanding; comprising five 10-inch siege mortars; to fire the same as Battery Reynolds.

Eighth. Battery Hays; Captain R. G. Shaw, Third Rhode Island Infantry, commanding; comprising one 8-inch Parrott rifle; against the gorge wall of Fort Sumter, with shot exclusively; and seven 30-pounder Parrott rifles against Fort Wagner or Battery Gregg, as may from time to time be ordered.

Ninth. Battery Reno; Captain A. W. Colwell, Third

Rhode Island Volunteer Artillery, commanding; comprising one 8-inch and two 100-pounder Parrott rifles; against the gorge wall of Fort Sumter; one 100-pounder to fire shot, and the other pieces to fire percussion shell exclusively.

Tenth. Battery Stevens; Lieutenant J. E. Wilson, First United States Artillery, commanding; comprising two 100-pounder Parrott rifles; against the gorge wall of Fort Sumter, one piece firing shot and the other percussion shell exclusively.

Eleventh. Battery Strong; Captain S. H. Gray, Seventh Connecticut Volunteer Infantry, commanding; containing one 10-inch Parrott rifle; against the gorge wall of Fort Sumter, firing shot and percussion shell, commencing with the former.

Twelfth. Battery Kirby; Lieutenant Charles Sellmer, Eleventh Maine Volunteer Infantry, commanding; comprising two 10-inch sea-coast mortars; against Fort Sumter, the shells to be exploded within the fort just before striking.

* * * * * * * *

By order of

Brigadier-General Q. A. GILLMORE.

ED. W. SMITH,

Assistant-Adjutant-General.

144. The exact distances of the several breaching batteries from the centre of the gorge wall of Fort Sumter was as follows:

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NAVAL BATTERY.

Two 80 pounder Whitworth Rifles, Breaching Battery against Fort Sumter. Distance 5353 yards; guns disabled each at 111th round by slipping within the reinforce, thereby closing vent.

Battery Brown,	Two 8-inch Parrott rifles,	3,516 yards	
" Rosecrans,	Three 100-pdr. (6.4-in.) " "	3,447	"
" Meade,	Two " " " "	3,428	"
Naval Battery,	Two 8-inch " " / Two 80-pdr. Whitworth rifles,	3,938	"
Battery Hays,	One 8-inch Parrott rifle,	4,172	"
" Reno,	One " " " / Two 100-pdr. (6.4-in.) " "	4,272	"
" Stevens,	Two " " " "	4,278	"
" Strong,	One 10-inch " "	4,290	"

(See Plates III. and IV.)

145. The breaching guns were served from day to day with great care and deliberation.

146. The firing from the batteries in the second parallel was seriously interfered with, and at times partially suspended, by the galling fire from Fort Wagner, to which the cannoneers were exposed. The combined fire of our mortars and light pieces, aided by the gunboats and iron-clads, failed to subdue this annoyance entirely, and we were obliged to turn some of our breaching guns upon the work. There was imminent danger, indeed, that our most efficient, because most advanced, batteries, would be helplessly disabled before the work of demolition should be accomplished. Nothing of the kind, however, happened. A heavy northeasterly storm set in on the 18th, and raged for two days, very materially diminishing the accuracy and effect of our fire.

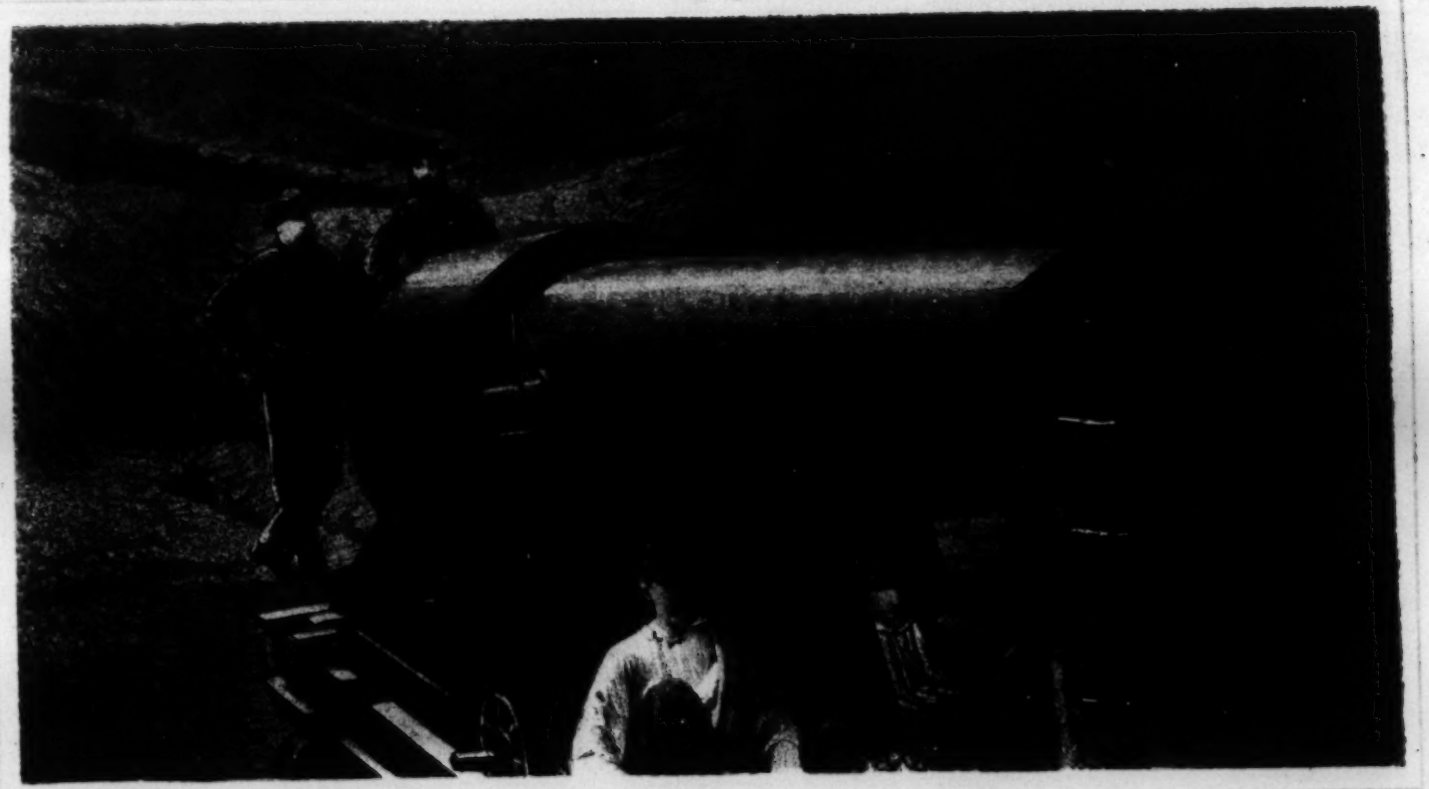
147. On the 21st of August a demand was made on General Beauregard for the evacuation, by the Confed-

erate forces, of Morris Island and Fort Sumter, accompanied by the assurance that the city of Charleston would be bombarded in case of refusal.* After waiting ten hours beyond the time specified, and receiving no reply, the "Marsh Battery" opened fire on the city, firing only a few shots. Firing was resumed the second night thereafter, but the piece (an 8-inch Parrott rifle) burst at the thirty-sixth discharge, blowing out the entire breech in rear of the vent. No guns were placed in the "Marsh Battery" after this. It was subsequently armed with two 10-inch sea-coast mortars, to aid in subduing the fire of the James Island batteries when the navy should move in. Firing upon the city was not resumed until after all of Morris Island came into our possession, and we were enabled to mount guns on Cummings Point.

148. On the 24th of August I reported to the general-in-chief "the practical demolition of Fort Sumter as the result of our seven days' bombardment of that work." Firing from the breaching batteries ceased for a time on the evening of August 23d.

149. The barbette fire of the work was entirely destroyed. A few unserviceable pieces, still remaining on their carriages, were dismounted a week later. The casemates of the channel fronts were more or less thoroughly searched by our fire, and we had trustworthy information that but one serviceable gun remained in the work, and that pointed up the harbor toward the

* See Correspondence with General Beauregard.



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10-INCH PARROTT RIFLE. (300 pounder.)

Muzzle blown off by premature explosion of Shell Breaching battery against Fort Sumter. 4290 yards distant.

city. The fort was reduced to the condition of a mere infantry outpost, alike incapable of annoying our approaches to Fort Wagner, or of inflicting injury upon the iron-clads.

150. The enemy soon after commenced removing the dismounted guns by night, and not many weeks elapsed before several of them were mounted in other parts of the harbor. The period during which the weakness of the enemy's interior defences was most palpably apparent was during the ten or fifteen days subsequent to the 23d of August, and that was the time when success could have been most easily achieved by the fleet. The concurrent testimony of prisoners, refugees, and deserters, represented the obstacles in the way as by no means insurmountable.*

* In Rear-Admiral Dahlgren's official report of the operations of his fleet before Charleston, dated "Flagship Philadelphia, off Morris Island, January 28th, 1864," occur some passages containing expressions of opinion, to which I desire to allude with brevity, although with candor. It is simply my wish to give free expression to my own views on this subject. In speaking of the second assault on Fort Wagner, July 18th, the admiral says: "This was the end of the second part of the operation, and proved that the work was too strong and too pertinaciously defended to be taken by any off-hand blow. The slow and laborious occupation by trench and cannon only were capable of reducing it. And here I may remark that in this necessity is to be found a principal cause for the delay in reaching Charleston that subsequently ensued. It was no doubt unavoidable, for it is to be presumed that no more troops could *then* be spared from the main armies. If there had been sufficient to make such an assault as would have overpowered all opposition, Wagner might have been carried at the first assault; Gregg would

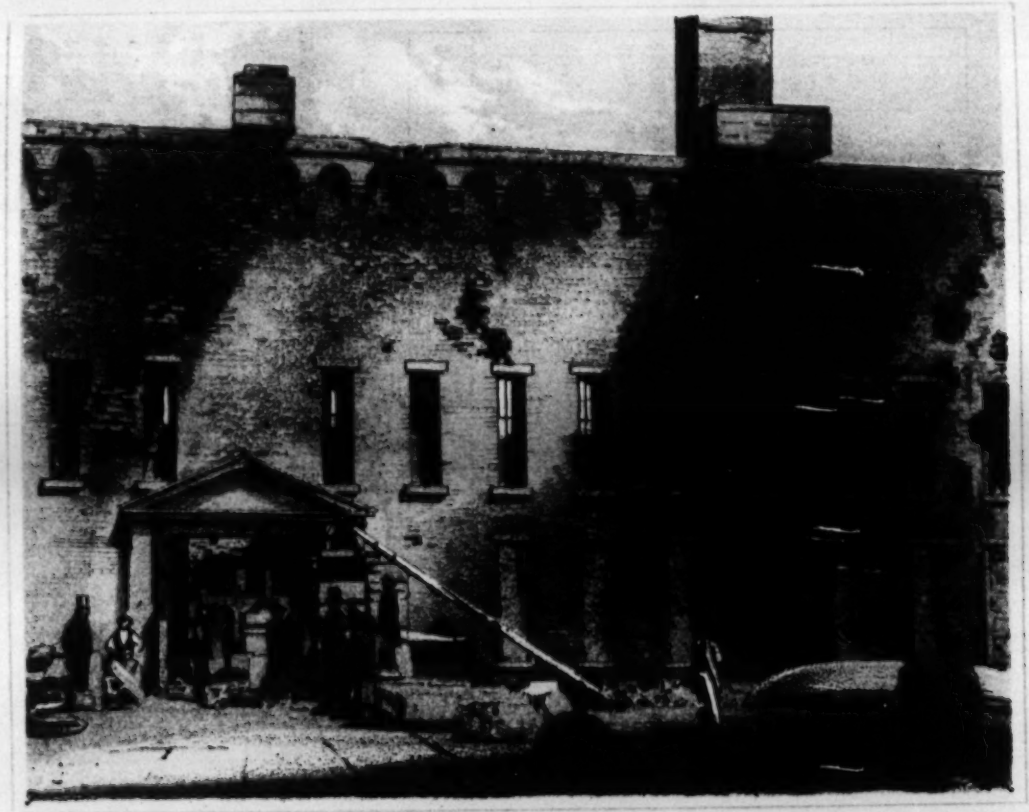
151. *Tabular Statement of Firing at Fort Sumter during the Seven Days' Bombardment, from 17th to 23d August*, 1863:

Name of Battery.	No. and calibre of Parrott Rifles.	Distance from Battery to centre of Gorge Wall, in yards.	Whole No. of Projectiles thrown.	Total Weight of Metal thrown.	No. of Projectiles which struck Fort.	No. which struck Gorge Wall and helped to form Breach.	Weight of Metal which formed Breach.
Strong....	One 300-pdr.	4,290	76	19,142	46	22	5,500
Brown....	Two 200-pdrs.	3,516	542	82,070	299	198	32,670
Hays.....	One 200-pdr.	4,172	531	86,129	225	196	33,320
Reno....	One 200-pdr.	4,272	333	115,171	480	316	38,940
	Two 100-pdrs.	4,272	784				
Rosecrans.	Three 100-pdrs.	3,447	1,173	105,807	587	392	37,240
Meade....	Two 100-pdrs.	3,428	1,004	98,282	502	336	98,392
Stevens...	Two 100-pdrs.	4,278	566	46,082	340	208	43,924
Total.....			5,009	552,683	2,479	1,668	289,986

For plans and sections of Fort Sumter see Plate V.

For a view of Fort Sumter on the 23d of August as seen from Morris Island see Plate VI.

have yielded immediately; Sumter would soon have followed, as a matter of course, and the iron-clads, untouched by severe and continued battering, would have been in condition to come quickly in contact with the then imperfect interior defences. The rebel movements clearly indicate that they admitted the impracticability of defending Morris Island, and consequently Sumter, after our position on it was fully established and covered by the iron-clads. They only sought to hold the island long enough to replace Sumter by an interior position; hence every day of defence by Wagner was vital to that of Charleston. This policy was successful for two months,



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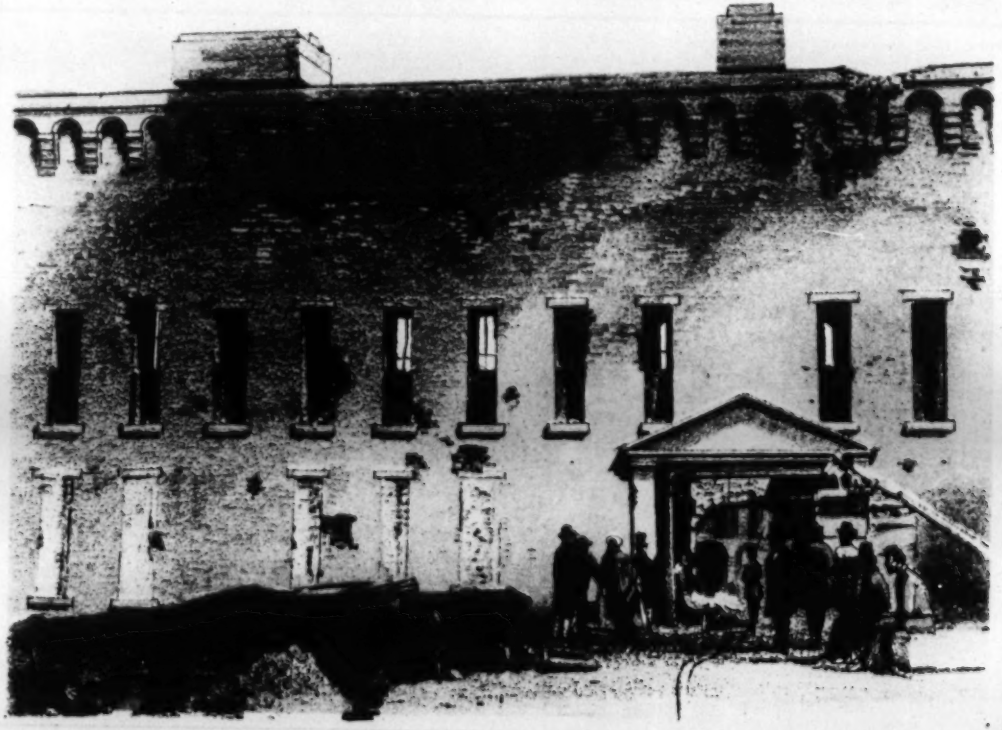
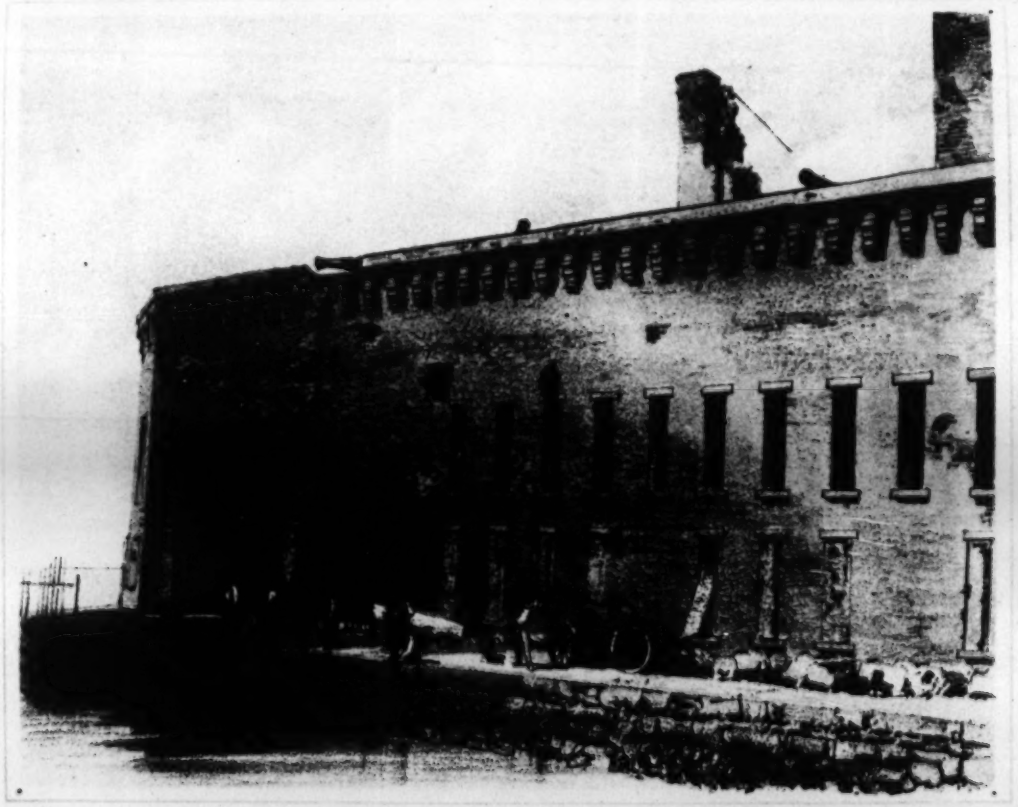
EXTERIOR VIEW OF THE GORGE OF FORT SUMTER ON THE 14TH APRIL 1861.

after its evacuation by Maj Robert Anderson 1st Art. U.S.A. Comnd'g showing the main entrance & a portion of the Gorge to the south east.



EXTERIOR VIEW OF THE GORGE OF FORT SUMTER ON THE 14th APRIL 1861

after its occupation by Maj. Robert Anderson 1st Art. U.S.A. Commdg. showing the main entrance & a portion of the bridge to the north e.s.



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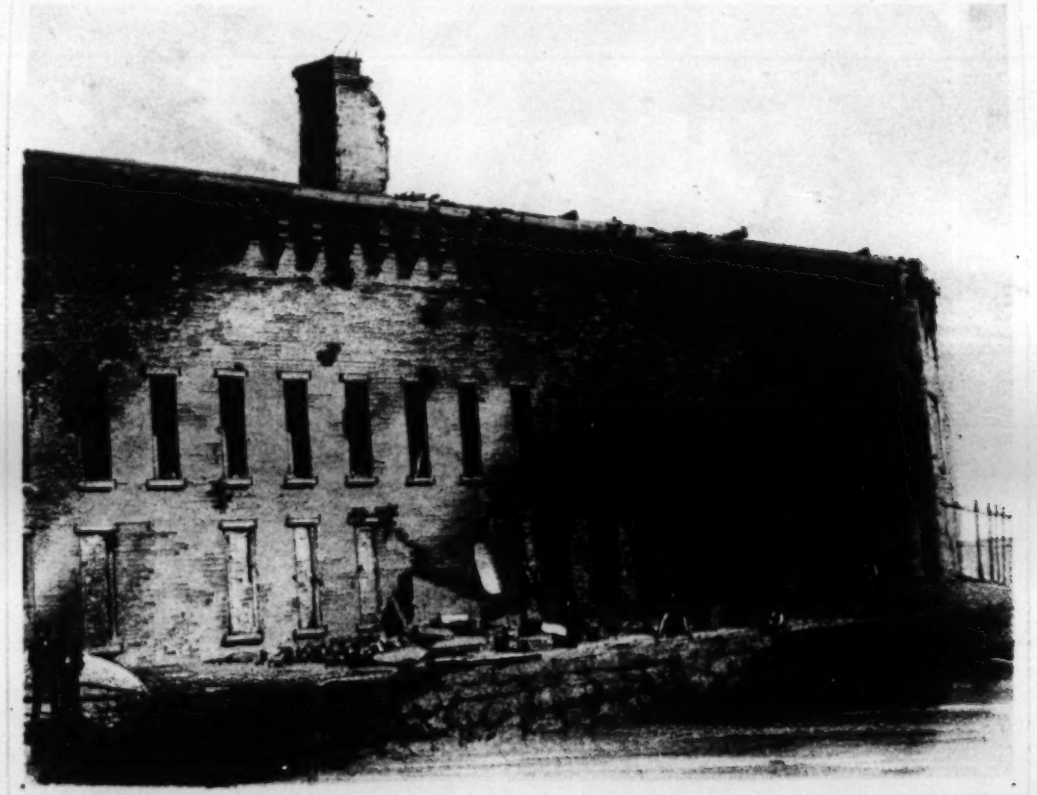
EXTERIOR VIEW OF THE GORGE OF FORT SUMTER ON THE 14TH APRIL 1861.

after its evacuation by Maj Robert Anderson 1st Art.y U.S.A. Comm.g showing that portion towards Fort Johnson James Island.



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EXTERIOR VIEW OF THE GORGE OF FORT SUMTER ON THE 14TH APRIL 1861.

after it's evacuation by Maj Robert Anderson 1st Art.y U.S.A. Comm.dr showing that portion towards Cummings Point, Morris Island

152. Meanwhile, on the night of August 18th, active operations were resumed on the approaches to Fort Wagner, by debouching with the full sap from the left of the third parallel. The spring tides, aided by a powerful northeast storm, had submerged the trenches to a depth of two feet in many places, and washed down the

(10th July to 7th September,) and gave time to convert Fort Johnson from a forlorn old fort into a powerful earthwork—improved by the experience of Wagner."

Now, so far from its being true that Fort Wagner stood at all in the way of a prompt execution of the projected naval operations before Charleston, a glance at the chart will show that the fleet in entering Charleston harbor need not necessarily go within effective range of Wagner at all. Prior to its capture our iron-clads passed and repassed that work frequently, and with impunity, and without even drawing its fire.

The capture of Wagner was, at the outset, presumed to be a necessary preliminary to the demolition of "Sumter," on account of its distance from the latter, (about 2,600 yards,) and occupying, as it did, a position that could not be turned, directly, on our line of approach.

Two unsuccessful assaults on Wagner induced the attempt to destroy Sumter by firing over the former, an operation which culminated in success on the 23d of August. Sumter, the great primary obstacle to the entrance of the iron-clads, was then entirely *hors-du-combat*, and powerless for offence or defence by artillery in forty-four days after we secured a lodgment on Morris Island. Some time elapsed before any of its guns were mounted by the enemy at other points in the harbor. These were the decisive days, when the enemy was comparatively weak and unprepared, for he had no idea that an attempt would be made, or if made could be successful, to demolish Sumter at the distance of two miles, and he was in no condition to meet such a result.

The failure of the fleet to enter immediately after the 23d of August, whether unavoidable or otherwise, gave the enemy an oppor-

parapets. At the second parallel the "Surf Battery" had barely escaped entire destruction, about one-third of it having been carried away by the sea. Its armament had been temporarily removed to await the issue of the storm. The progress of the sap was hotly opposed by the enemy, with the fire of both artillery and sharpshooters. At one point in particular, about two hundred yards in front of "Wagner," there was a ridge, affording the enemy good cover, from which we received an unceasing fire of small-arms, while the guns and sharpshooters in "Wagner" opened vigorously at every lull in the fire directed upon it from our batteries and gunboats. The firing from the distant James Island batteries was steady and accurate. One attempt,

tunity, doubtless much needed, to improve their interior defences. Of the actual strength of those improvements we had no reliable information, as they were never tested or encountered by the iron-clads.

It may be further remarked, that during the many months that operations before Charleston were suspended, awaiting the movements of the fleet, and even subsequently, when all idea of making an attempt to enter had been abandoned, I never once heard it intimated by the admiral, or by any one else, that the time necessarily consumed in reducing Fort Wagner had anything to do with his delay. Fort Wagner was simply an advanced work of Fort Sumter, and was intended to keep an enemy beyond breaching distance of the latter work.

It was reduced subsequent to the demolition of Sumter, not because it could retard, in the least, the operations of the iron-clads, but to give us Cummings Point, a position affording us more complete control of the channel and harbor than any we had previously held, and to enable the fleet, by occupying an inner and shorter line, to enforce a more perfect blockade.—Q. A. G.

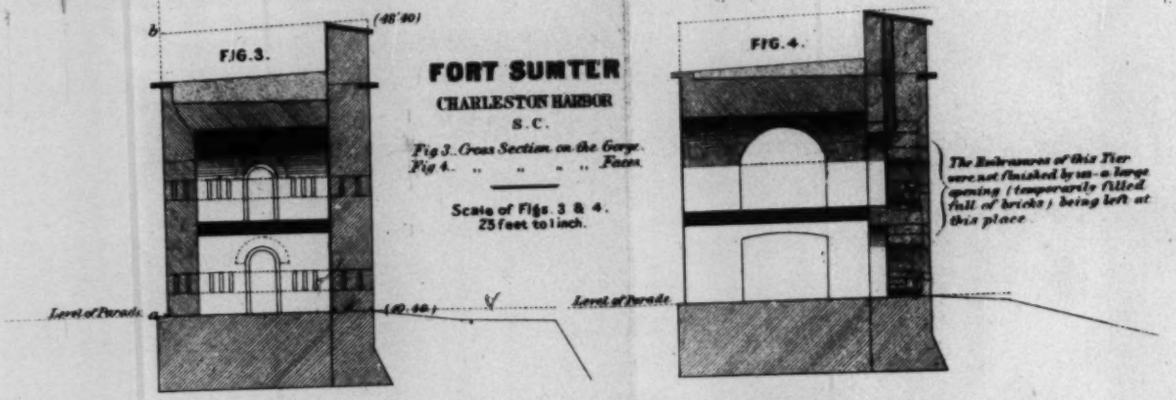
FORT SUMTER

CHARLESTON HARBOR

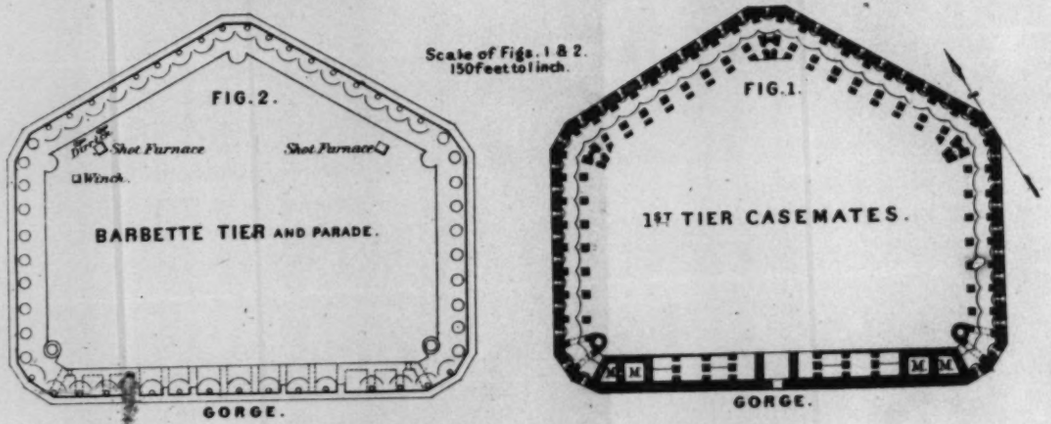
S.C.

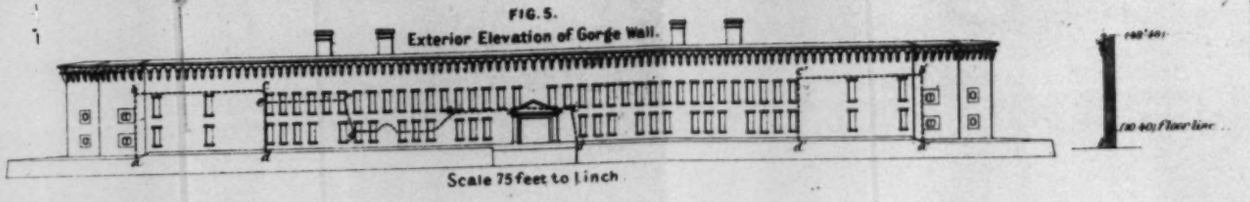
Fig 3. Cross Section on the Gorge.
Fig 4. " " " " Faces.

Scale of Figs. 3 & 4.
75 feet to 1 inch.



Scale of Figs. 1 & 2.
150 feet to 1 inch.





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on the 21st, to obtain possession of the "ridge" with infantry having failed, it was determined to advance by establishing another parallel.

FOURTH PARALLEL.

153. On the night of August 21st the fourth parallel was opened about one hundred yards from the "ridge" above mentioned, partly with the flying sap and partly with the full sap. At the place selected for it the island is about one hundred and sixty yards in width above high water.

154. It was now determined to try and dislodge the enemy from the "ridge" with light mortars and navy howitzers in the fourth parallel, and with other mortars in rear firing over those in front. The attempt was made on the afternoon of August 26th, but did not succeed. Our mortar practice was not very accurate.

FIFTH PARALLEL.

155. Brigadier-General Terry was ordered, on the 26th of August, to carry the "ridge" at the point of the bayonet, and hold it. This was accomplished, and the fifth parallel established there on the evening of the same day, which brought us to within two hundred and forty yards of Fort Wagner. The intervening space comprised the narrowest and shallowest part of Morris Island. It was simply a flat ridge of sand, scarcely twenty-five yards in width, and not exceeding two feet

in depth, over which the sea in rough weather swept entirely across to the marsh on our left.

156. Approaches by the flying sap were at once commenced on this shallow beach, from the right of the fifth parallel, and certain means of defence in the parallel itself were ordered.

157.* It was soon ascertained that we had now reached the point where the really formidable passive defensive arrangements of the enemy commenced. An elaborate and ingenious system of torpedo mines, to be exploded by the tread of persons walking over them, was encountered, and we were informed by the prisoners taken on the "ridge," that the entire area of firm ground between us and the fort, as well as the glacis of the latter on its south and east fronts, was thickly filled with these torpedoes. This knowledge brought to us a sense of security from sorties, for the mines were a defence to us as well as to the enemy. After this time we entertained no serious apprehension of night sorties by the enemy, in any force. By daybreak on the 27th of August our sappers had reached, by a rude and unfinished trench, to within 100 yards of Fort Wagner.

158. The dark and gloomy days of the siege were now upon us. Our daily losses, although not heavy, were on the increase, while our progress became discouragingly slow, and even fearfully uncertain. The

* The reference to this paragraph from some of the plates of mortar guns is an error. See paragraph 184.

D. Van Nostrand, Publisher.

FORT SUMTER.

August 23d. 1863.

converging fire from "Wagner," alone, almost enveloped the head of our sap, delivered, as it was, from a line subtending an angle of nearly ninety degrees, while the flank fire from the James Island batteries increased in power and accuracy every hour. To push forward the sap in the narrow strip of shallow sifting sand by day, was impossible, while the brightness of the prevailing harvest moon rendered the operation almost as hazardous by night. Matters indeed seemed at a stand-still, and a feeling of despondency began to pervade the rank and file of the command. There seemed, indeed, no adequate return, in accomplished results, for the daily losses which we suffered, and no means of relief, cheering and encouraging to the soldier, appeared near at hand.

FINAL BOMBARDMENT AND CAPTURE OF FORT WAGNER.

159. In this emergency, although the final result was demonstrably certain, it was determined, in order to sustain the flagging spirits of the men, to commence vigorously and simultaneously two distinct methods of attack, viz.:

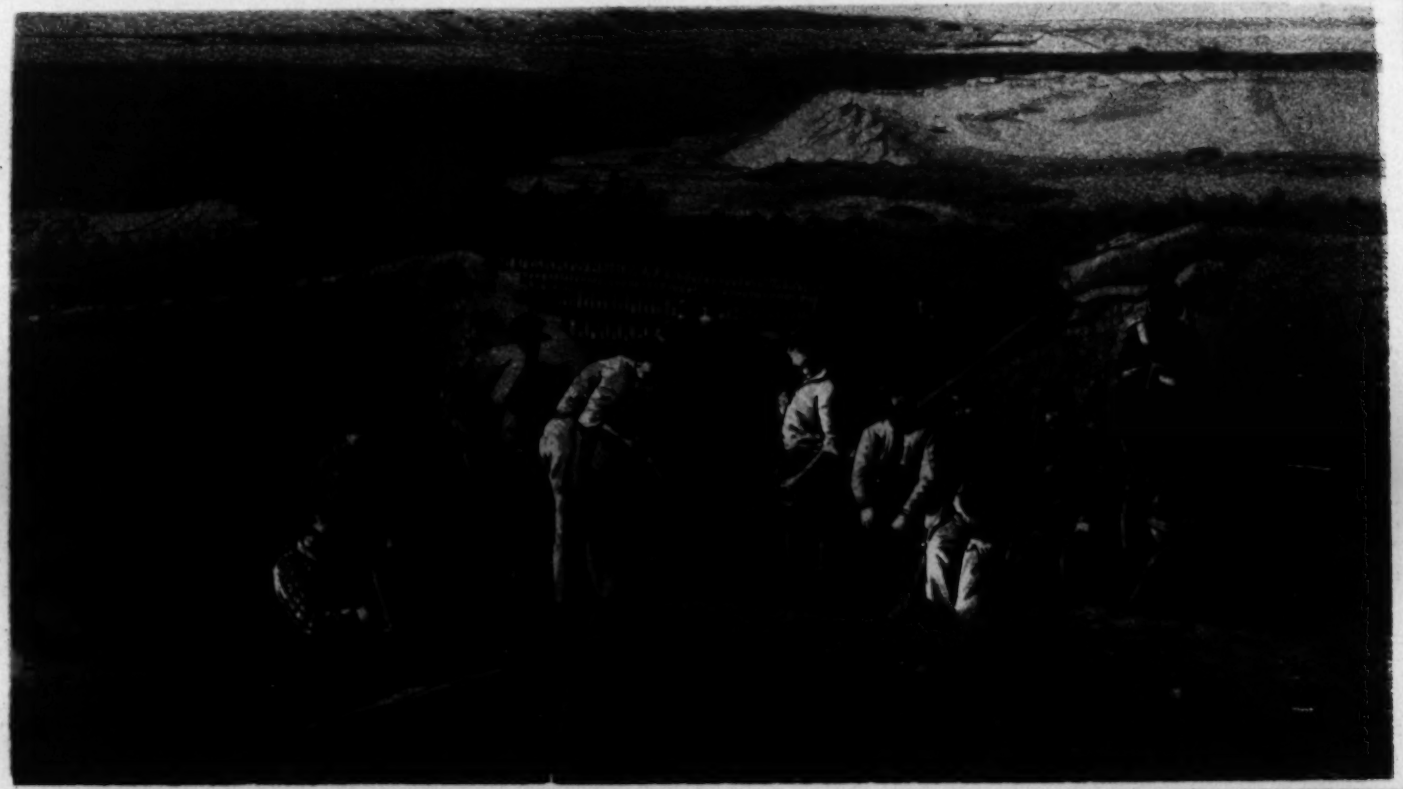
First. To keep "Wagner" perfectly silent with an overpowering curved fire from siege and coehorn mortars, so that our engineers would have only the more distant batteries of the enemy to annoy them; and,

Second. To breach the bomb-proof shelter with rifled

guns, and thus deprive the enemy of their only secure cover in the work, and consequently drive them from it.

160. Accordingly, all the light mortars were moved to the front and placed in battery; the capacity of the fifth parallel and the advanced trenches for sharpshooters was greatly enlarged and improved; the rifled guns in the left breaching batteries were trained upon the fort and prepared for prolonged action; and powerful calcium lights to aid the night-work of our cannoniers and sharpshooters, and blind those of the enemy, were got in readiness. The co-operation of the powerful battery of the "New Ironsides," Captain Rowan, during the daytime, was also secured.

161. These final operations against Fort Wagner were actively inaugurated at the break of day on the morning of September 5th. For forty-two consecutive hours the spectacle presented was of surpassing sublimity and grandeur. Seventeen siege and coehorn mortars unceasingly dropped their shells into the work, over the heads of our sappers and the guards of the advanced trenches; thirteen of our heavy Parrott rifles—100, 200 and 300-pounders—pounded away at short though regular intervals, at the southwest angle of the bomb-proof, while during the daytime the New Ironsides, with remarkable regularity and precision, kept an almost incessant stream of eleven-inch shells from her eight-gun broadside, ricocheting over the water against the sloping parapet of Wagner, whence, deflected upward with a low



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HEAD OF SAP, APPROACHES TO FORT WAGNER

remaining velocity, they dropped nearly vertically, exploding within or over the work, and rigorously searching every part of it except the subterranean shelters. The calcium lights turned night into day, and while throwing around our own men an impenetrable obscurity, they brilliantly illuminated every object in front, and brought the minutest details of the fort into sharp relief.

162. In a few hours the fort became practically silent, exhibiting but little sign of life, and none of activity. Occasional, straggling shots continued to be delivered at the New Ironsides, and one or more sharpshooters opened, from time to time, a hasty and ineffectual fire upon the head of the sap.

The garrison had sought safety in the bomb-proof shelter.

163. Our sappers now rapidly pushed forward their works. At this period they suffered principally from the James Island batteries, which night and day kept up a constant and galling fire upon our mortar batteries and the head of the sap, following the progress of the latter toward the fort, until the proximity became so imminent, that friends and foes alike shared in the perils of a common exposure. From this moment the men in the advanced trenches prosecuted their labors with entire immunity from serious danger. Indeed, their sense of security became so great, and the novelty of their position so exciting—with a once defiant foe helplessly

at bay, and only a few feet distant—that they fearlessly exposed themselves to view, and the reliefs of workmen off duty exultingly mounted the parapets of their works to while away their leisure moments, or, groping their way forward among the hidden torpedoes, with a skill and address which the most bitter experience only could have conferred, they approached the ditch and took a deliberate survey of the fort and its surroundings.

164. Soon after dark on the night of September 6th, our sappers pushed by the south face of the fort, leaving it on their left, and crowned the crest of the counterscarp near the flank of the east or sea front, completely masking all the guns of the work, except those in the flank referred to, which, as it had been found impossible to use them, had been removed to prevent their being destroyed by our mortar fire. A row of long pikes or lances, planted at the foot of the counterscarp of the sea front as an obstacle, was removed by our sappers.

The following order to carry the place by assault at the hour of low tide on the following morning, was issued late in the evening. That hour was selected to give us the use of the broad beach for the assaulting columns to move upon.

165. DEPARTMENT OF THE SOUTH,
HEADQUARTERS IN THE FIELD,
MORRIS ISLAND, September 6th, 1864.

Special Orders.
No. 513.

I. Fort Wagner will be assaulted at 9 o'clock A. M.,

to-morrow, the 7th inst., by troops to be designated by Brigadier-General Terry, who will command in person.

The artillery fire on the work will be kept up until the troops mount the parapet, and will then cease at a given signal.

The assault will be in three columns, as follows:

First. A column of two small regiments of picked troops will debouch from the advanced trenches, mount the parapet of the sea front, and the bomb-proof and traverses, spike the guns, and seize and hold the sally-port.

Second. A column of one brigade, drawn up right in front in the trenches, in rear of the first column, will debouch upon the beach by regiments, pass the sea front of the fort, file sharp to the left, and mount the parapet of the north and west faces, regiment after regiment, as they gain the requisite distances.

Third. A column of one brigade, left in front, will follow behind the second column, and deploy across the island in rear of Fort Wagner, facing Cummings Point, with skirmishers well out in front.

II. The guards of the trenches will be held in reserve at their appropriate stations. The balance of the infantry force of General Terry's command will be kept under arms from and after 8 o'clock in the morning,

near the Beacon House. The batteries of field artillery will be held ready for action near the Lookout.

By order of

Brigadier-General Q. A. GILLMORE.

ED. W. SMITH,

Assistant-Adjutant-General.

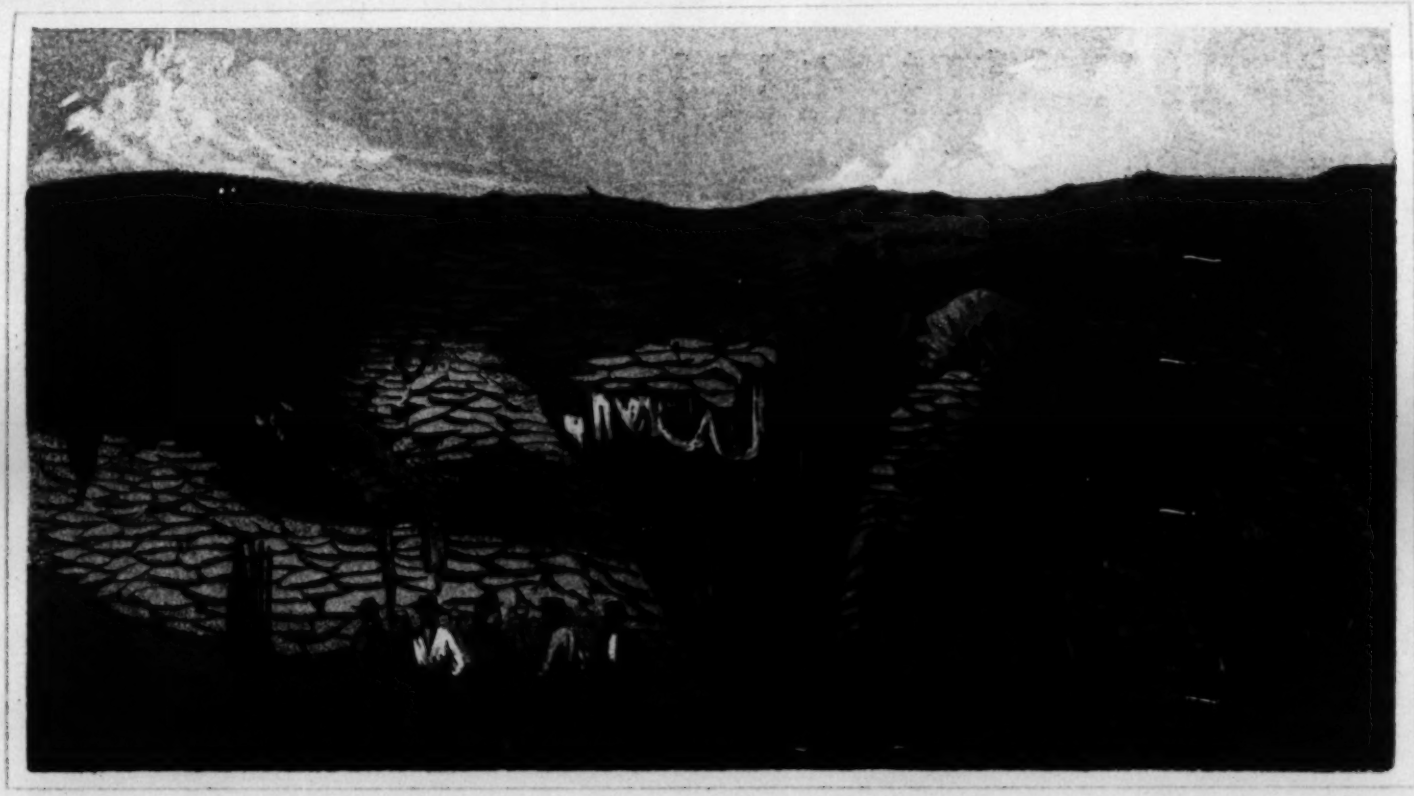
166. About midnight on the 6th it was reported to me that the enemy was evacuating the island. Such was the celerity of his flight, that nearly the whole of his force made its escape. Seventy men were intercepted on the water and taken.

167. Our forces at once occupied the north end of the island. Eighteen pieces of ordnance of various calibres were captured in Fort Wagner, and seven in Battery Gregg, making an aggregate of thirty-six pieces taken on the island. Nearly all of them were large.

168.* Fort Wagner was found to be a work of the most formidable character—far more so, indeed, than the most exaggerated statements of prisoners and deserters had led us to expect. Its bomb-proof shelter, capable of containing from 1,500 to 1,600 men, remained practically intact, after one of the most severe bombardments to which any earthwork was ever exposed.

169. The attempt to form an opening into the bomb-proof by breaching, failed for want of time. The heavy

* The reference to this paragraph from some of the plates of bursted guns is an error. See paragraph 186.



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ONE ENTRANCE TO BOMB PROOF, FORT WAGNER.

Just after its capture, Sept 7th 1863. Entrance open to the West.

J Bien, Lith

projectiles were slowly eating their way into it, although their effect was astonishingly slight. Indeed, the penetration of rifle projectiles, fired into a sand parapet, standing at the natural slope, or approximately so, is but trifling. They are almost invariably deflected along the line of least resistance, or one departing but slightly from it, scooping out in their progress a small hollow, the contents of which are scattered but a short distance. Under such circumstances, the general effect produced by firing a large number of successive shots, within a small area of say from fifteen to twenty feet square, is by no means commensurate with the necessary expenditure of ammunition.

Tabular Statement of Firing at Fort Wagner from the Breaching Guns, during the Two Days' Bombardment, September 5th and 6th, 1863.

Name of Battery.	No. and Calibre of Parrott Rifles.	Distance from Fort Wagner, yds.	Whole No. of Projectiles thrown.	Total Weight of Metal thrown, lbs.	No. of Projectiles which struck the Fort.	No. which struck the Bomb-proof.	Weight of Metal which struck Bomb-proof, in lbs.
Strong....	One 300-pdr.	1,900	88	22,000	78	78	19,500
Brown....	Two 200-pdrs.	885	135	19,575	104	87	12,615
Reno....	One 200-pdr.	1,850	168	51,615	126	105	38,688
	Two 100-pdrs.	1,850	345		306	297	
Rosecrans.	Three 100-pdrs.	880	141	11,139	132	125	9,875
Meade....	Two 100-pdrs.	820	210	20,580	196	187	18,326
Stevens....	Two 100-pdrs.	1,875	324	25,596	305	294	23,226
Total.....	13 Rifles.		1,411	150,505	1,247	1,173	122,330

170. The section, Plate VII., is taken along the line where this two days' firing upon the bomb-proof produced the greatest effect; in other words, along the axis of the breach produced.

171. The total quantity of sand removed to such a distance that it no longer afforded the bomb-proof shelter any protection against the projectiles from the breaching guns, is estimated, from a close personal examination, at 165 cubic yards. It required, as will be seen from the above table, 54½ gross tons of metal to effect it. From this is deduced, by a simple calculation, the fact that, supposing the sand which formed the bomb-proof covering to weigh 90 lbs. to the cubic foot, which is but 4 lbs. in excess of its weight when perfectly dry, it required 1 lb. of the metal, thrown from the breaching guns with the service charge, to remove $3\frac{37}{112}$ lbs. of sand.

The two controlling conditions of the case before us must not, however, be lost sight of, viz.:

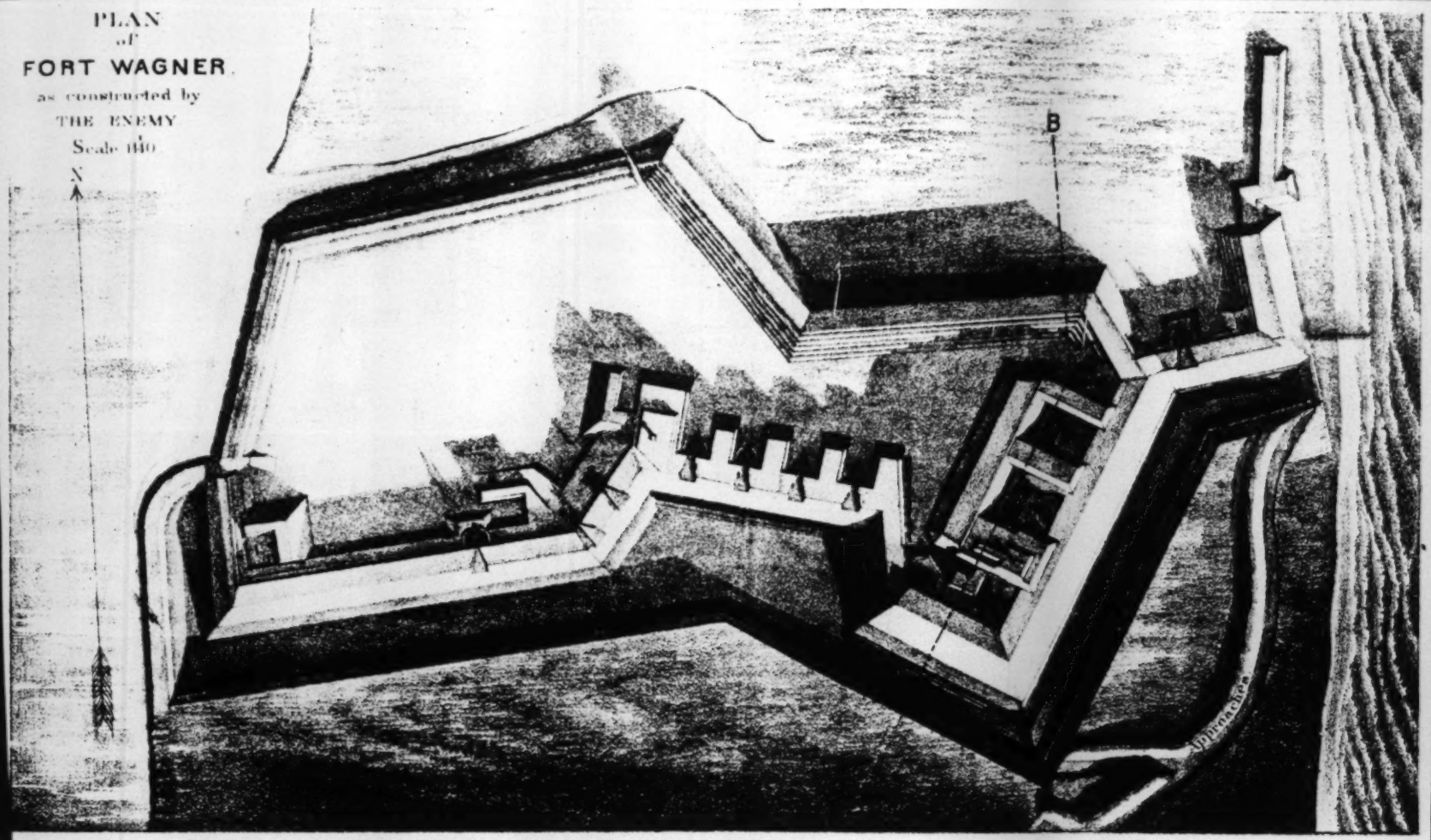
1st. That the slope fired at was flat, the angle of inclination being even smaller, after a few shots had been fired, than the slope which sand naturally assumes.

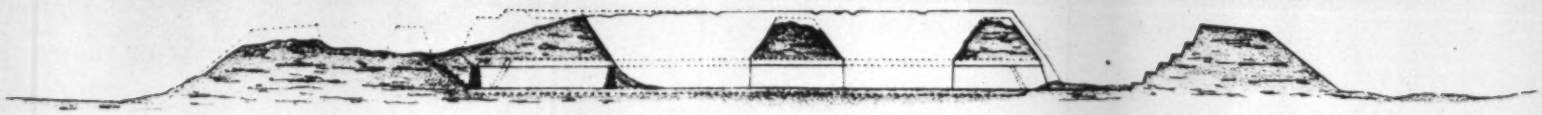
2nd. That a very large proportion of the sand thrown up by each shot fell back within the area struck by the successive shots; or, in other words, within the area fired at.

With these conditions borne in mind, the deduction

PLAN
of
FORT WAGNER
as constructed by
THE ENEMY
Scale 1/60

N





Vertical Section on the line A. B.

The approximate resultant of fire from the several breaching batteries, Sept 5th & 6th.

Scale 30 ft to 1 inch.

N.B. The firing was a little too much to the right to open the body of the bomb proof. The section is simply intended to show the quantity of sand removed, which was insufficient to open the bomb-proof even had the direction of fire been right. The magazine connecting with the bomb proof would soon have been breached.

Bien Lith. 24 Vesey St. N.Y.

does not appear as startling as when first brought to view.

172. Meanwhile, at the request of Admiral Dahlgren, three days' firing, commencing August 30th, from a portion of our breaching guns, had been expended on Fort Sumter, and it was known that all the barbette guns of that work had been dismounted. Deserters and prisoners reported that but one casemate gun remained serviceable, and that was located on the northwest face near its junction with the gorge, and consequently looked up the harbor toward the city, and could not be brought to bear upon a passing fleet.

173. Early on the morning of September 7th, Rear-Admiral Dahlgren sent a flag of truce to Fort Sumter, demanding its surrender, notifying me at the same time, by signals, that if the summons was not complied with, he should "move up with all the iron-clads and engage it." The demand was refused.

174. During the night of the 8th of September, a naval force attempted to carry "Sumter" by assault, and was repulsed with considerable loss. Before I was informed by the Admiral of his intention to storm the work, I had made arrangements to do the same thing, but the force assembled for that purpose was detained by low tide at its rendezvous, in the creek west of Morris Island, until after the naval attack had failed. The project was then abandoned. The only arrangements for concert of action between the two parties, that were

finally made, were intended simply to prevent accident or collision between them. Each party was deemed in itself sufficiently strong for the object in view.

175. The capture of all of Morris Island and the demolition of Fort Sumter, completed those portions of the plan of joint operations against the defences of Charleston, in which the land forces were to take the lead. Fort Wagner and Battery Gregg were at once strengthened, and additional defensive works on the island constructed. A powerful armament of mortars and rifled guns was placed in position, on the north end of the island, to be held in readiness to co-operate with the iron-clads whenever they should be prepared to move in, and also to be used as occasion might require, to prevent the mounting of guns on the ruins of "Sumter."

176. Admiral Dahlgren apprehended serious annoyance from the musketry fire that might be delivered from "Sumter," whenever he should attempt to remove the channel obstructions, and one object of the large armament on Morris Island was to subdue this fire of small arms, during the passage of the fleet up the harbor.

177. The three days' firing on Fort Sumter, with a portion of the breaching guns in the left batteries and the second parallel, ending September 1st, did not materially alter the appearance of the work, as shown in Plate VI., taken at the close of the first bombardment, August 23d.

178. Up to this time only the gorge wall had been

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FORT PUTNAM.

J Bien, Lith.

Formerly Rebel Battery GREGG on Cummings Point Sullivan's Island in the extreme distance on the right

breached. The southeast face, the only one seen from our position except the gorge, remained standing, although badly shattered in many places. All the barbette guns had been either dismounted or hopelessly disabled, and, as a means of defence against the ironclads, the work was entirely useless. Possession was retained by the enemy, with a view, doubtless, of remounting guns there, whenever a cessation in our fire would enable him to do so.

SECOND BOMBARDMENT OF FORT SUMTER.

179. In consequence of the reports of prisoners and deserters, from time to time, that the enemy were at work remounting some guns on the southeast face of "Sumter," and also with the intention to cut down that face so as to enable us, with the fire from our guns, to take more completely in reverse the casemates on the channel fronts, the heavy rifle guns in "Wagner" and "Gregg" were opened on the work on the 26th of October.

180. In a few days the southeast face was more completely a ruin than the gorge wall. The débris formed a continuous and practicable ramp, reaching from the summit of the breach to the level of the water. The two faces of the work seen from Morris Island were both in ruins. See Plate VIII. and the supplementary report of Brigadier-General Turner, chief of artillery.

181. With the second bombardment of Fort Sumter

ended all aggressive operations for the season against the defences of Charleston.

A slow and irregular fire upon the work was kept up for several weeks from Cummings Point, to prevent repairs and the remounting of guns on the ruins, pending the completion of the naval preparations for entering the inner harbor. This fire was continued throughout the month of November and much of December. Indeed, it was not suspended until the project of attempting to remove or destroy the channel obstructions, and run by the James and Sullivan's Island batteries with the iron-clads, appeared to be definitely abandoned. I never received any official information of this determination, although as early as the 20th of October the admiral informed me, verbally, that he would probably await the arrival of more monitors, several of which had been promised, and were expected to arrive in a few days.

182. The bombardment of the city of Charleston, which began from the "Marsh Battery," or "Swamp Angel," on the night of the 21st of August, was not resumed after the bursting, at the thirty-sixth round, of the 8-inch Parrott rifle which formed the entire armament of that battery, until we were able to establish guns on Cummings Point. No military results of great value were ever expected from this firing. As an experiment with heavy guns, to test their endurance under the severest trial to which they could possibly be sub-

jected in actual service, the results were not only highly interesting and novel, but very instructive.

183. None but Parrott rifles and projectiles were used for shelling Charleston. Some of the shells were incendiary, so called, and were prepared at the West Point foundry. Others contained pieces of port-fire in addition to the explosive charge. A few were filled with a preparation known as Short's "solidified Greek fire;" while many contained the explosive charge of powder only. For the results obtained with the Greek fire, see further on. Our experiments with this material elicited the fact that it possesses no advantages over the ordinary port-fire prepared at our arsenals.

GENERAL OBSERVATIONS, NOTES, AND SUGGESTIONS.

PARROTT RIFLED GUNS AND PROJECTILES.

184. There are perhaps no cast-iron hooped rifle guns in general use superior to Parrott's 10, 20, and 30-pounders, (2.9-inch, 3.64-inch, and 4.2-inch bores,) considered with regard to all the essential requisites of a good and reliable gun; certainly none apparently more simple in construction, more easily understood, or that can, with greater safety to the piece itself, be placed in the hands of inexperienced men for service. The enormous and constant demand, under which they have been rapidly developed to their present degree of excellence,

gives promise of a state of efficiency that will leave little to be desired at no distant future. Much still remains to be accomplished in the manufacture of Parrott's large rifles (his 6.4-inch and 8-inch calibres especially) before they can be considered as reliable. In another part of this report we will discuss this subject more fully.

185. Parrott's projectiles, as now manufactured, are both simple and generally effective. They receive the rotary motion from a ring of wrought iron or of brass set around the base of the projectile, and flush with it. The most serious defects in these projectiles that had to be overcome in the infancy of the invention, were that fully one-tenth of them failed to take the grooves, and consequently took a wild flight, while nearly as large a proportion prematurely exploded, generally before leaving the gun, in consequence, it is believed, of defects in the casting. The causes of both these imperfections are now removed, in a great measure.

186. *Particulars of Parrott Rifled Guns.*

Guns.	Diameter of Bore.	Length of Bore.	Weight of Gun.	Calibre.
	Inches.	Inches.	Pounds.	
10-pdr.	2.90	70	890	3-pdr. smooth bore.
20-pdr.	3.67	79	1,750	6-pdr. " "
30-pdr. army.	4.20	120	4,200	9-pdr. " "
30-pdr. navy.	4.20	96.8	3,550	9-pdr. " "
100-pdr.	6.40	130	9,700	32-pdr. " "
200-pdr.	8.00	136	16,500	8-inch " "
300-pdr.	10.00		26,000	10-inch " "

187. *Charges and Weights of Parrott Projectiles.**

Guns.	Charge.	Weight of Projectiles.
	Pounds.	Pounds.
10-pdr.	1	9¾ to 10½
20-pdr.	2	18¾ to 19½
30-pdr. army.	3½	About 29
30-pdr. navy.	3½	" 29
100-pdr.	10	80 generally
200-pdr.	16	150 "
300-pdr.	25	250 "

188. *Ranges of Parrott's Rifles.*

Guns.	Elevation.	Projectiles.	Range.	Time of Flight.
	Degrees.	Pounds.	Yards.	Seconds.
10-pdr.	5	Shell 9¾	2,000	6½
10-pdr.	10	" 9¾	3,200	10¾
10-pdr.	20	" 9¾	5,000	21
20-pdr.	5	" 18¾	2,100	6½
20-pdr.	10	" 18¾	3,350	11¼
20-pdr.	15	" 18¾	4,400	17¼
30-pdr.	15	" 29	4,800	17½
30-pdr.	25	" 29	6,700	27
30-pdr.	15	Long shell 101	4,790	18
30-pdr.	25	" " 101	6,820	28
30-pdr.	25	Hollow shot 80	7,180	29½
30-pdr.	35	" " 80	8,453	36¾

* In our operations before Charleston Parrott's guns were always fired with the charges and weight of projectile indicated in this table.

189. *Average Ranges obtained with Parrott's Rifles on Morris Island.*

Guns.	Elevation.	Charge.	Range.
	Deg. Min.	Pounds.	Yards.
300-pdr.	13 30	26	4,290
200-pdr.	11 47	16	4,272
100-pdr.	13 30	10	4,272
300-pdr.	5 12	25½	1,950
200-pdr.	4 12	16	1,750
100-pdr.	4 15	10	1,750

190. Parrott's large rifles possess grave defects. The most serious of these we found to be their very unequal and uncertain endurance. Some of our most valuable batteries on Morris Island were disabled by the expenditure of the guns at a very early stage in the operations. The 8-inch rifle in the "Marsh Battery" burst at the thirty-sixth discharge at a constant elevation (except one firing) of 31° 30′, and at a constant charge of sixteen pounds. The projectile weighed one hundred and fifty pounds.

191. For the purpose of comparison take two 100-pounders, which burst as follows: one of them at the one hundred and twenty-second round, at 3° 15′ elevation—the greatest elevation having been 3° 20′, and the average 3° 18′—while the other burst at the eleven hundred and fifty-first round, at 12° 30′ elevation—the greatest elevation having been 13° 55′, and the average 13°. Ten pounds of powder was the constant charge for both pieces. The projectile weighed eighty pounds.

192. By far the most remarkable example of endurance furnished by any of our guns, and perhaps the most remarkable on record, was that of a 4.20-inch (30-pounder) Parrott rifle. The following history of the piece is furnished by Captain Mordecai, chief of ordnance of this department. The gun was cast at the West Point foundry in 1863; its ordnance number is 193; it was mounted on Cummings Point in December, 1863, for the purpose of throwing shells into the city of Charleston; it was placed on a plain wooden carriage manufactured on Morris Island. Sixty-nine days elapsed between the first and last discharges of the gun. It was being fired the four thousand six hundred and sixth round when it burst. There were fired four thousand five hundred and ninety-four rounds with three and three-quarter pounds of powder, and percussion shells of twenty-nine pounds, charged with one and a half pounds of powder, with an elevation of 40°; one round with the same as above except the elevation, which was 49° 45′; seven rounds with the same as above except that time fuses were used, with 40° elevation.

Four rounds were fired with 3¼ lbs. of powder, time-fuze, 4⅝-inch shells weighing 29 lbs., and charged with 1¼ lbs of powder; elevation 2° 50′.

Of these rounds, 4,253 shells reached the city; 259 tripped and fell short; 10 took the rifling and fell short; 80 exploded prematurely, but none in the gun; and 4 were fired at Fort Sumter and reached it, the distance

being 1,390 yards. The first 2,164 rounds were fired at intervals of 5 minutes, but the firing at that rate was not continuous, 237 rounds being the greatest number fired in any one 24 hours, and 2 rounds the least; the average per day was 127 rounds.

The last 2,442 rounds were fired at intervals of 15 minutes, not continuously, 157 rounds being the greatest number fired in any one day and 7 the least, the daily average being 97 rounds. All the shells were swedged and greased. The gun was cleaned after each discharge, first with a dry sponge and then with an oiled one; it was washed out with water and cooled after every 10 fires. After the gun was loaded, and while waiting to be fired, a canvass cap was placed over the muzzle, to keep out drifting sand, and every care was taken that the gun should be clear from sand and dirt when fired. The vent of the gun was bouched twice during the time it was used. The bouching in use when the gun gave out was somewhat eaten, but very regularly, and not badly, the diameter of vent at the exterior being $\frac{37}{100}$ of an inch, and the interior $\frac{37}{100}$ inch. The gun when it burst went into seven pieces; the muzzle and chase back to the axis of trunnions being one piece; that part of the cast-iron reinforce from six inches in rear of the front of the wrought-iron band, with the band, breach and cascable, being a second piece. The metal between these two pieces went into five fragments, two below the axis of gun and three above, one of the latter being quite small and located in front of the trun-

nions. The fracture within the band took place nearly in two planes, each being perpendicular to the axis of the gun. Three cracks extended back to the bottom of the bore, each along the junction of a land and groove; one immediately to the left of the vent, but not through it; one 1½ inches to the right; and the third 3½ inches to the left of the vent. The locality of the above fracture is at the point where the ring of the projectile rested when the gun was discharged.

The upper side of the bore, over and in front of the projectile when at rest, is much eaten by the gas. In some places along the junction of a land and groove, these gutters are ½ inch in depth and 12 inches long. The surface of both lands and grooves are much guttered, though not deeply. On the lower side, 9 inches from the bottom of the bore, the edge of the lower land is entirely worn away, and this extends forward 12 inches. From 12 inches in rear of trunnions to within 4 inches of muzzle, the grooves are apparently unworn. At the muzzle on the lower side, the land is entirely worn away, down even below the bottom of the grooves. This wearing took place mostly to the right of a vertical plane through the axis of the piece. The diameter of the wrought iron band at the front is increased about $\frac{3}{1000}$ of an inch, caused by the fragments in escaping from within it. It is presumed that mortar powder was used in this gun, as that was the order. The records are not explicit on this point. (See Plates IX., X. and

XI., showing the fragments of this gun and the final condition of the bore at the seat of the shot.)

193. Plates XII. to XXXIV., inclusive, exhibit drawings and a brief history of bursted or disabled guns. They were prepared under Captain Mordecai's direction. So far as could be ascertained from the guns themselves, the foundry and inspection numbers are placed upon the drawings, the former directly above the latter. The record is not full in each case, but as much so as the reports of battery commanders rendered possible. A portion of the fragments of some of the bursted guns were covered up by drifting sand and lost, but enough were preserved in each case to furnish a sufficiently correct idea of the fractures.

194. By an examination of the plates, it will be seen that, with some of the pieces, the entire breach was blown out, the fracture taking place about one inch in rear of the vent, and in a surface nearly at right angles to the axis of the gun, leaving the wrought iron reinforce intact upon the other portion of the piece. In other words, the guns were broken square off under the reinforce. This kind of fracture occurred more frequently with the 200 than with the 100-pounders. The surface of fracture, in each case, might be termed conchoidal, with the convexity toward the front. It would be more nearly correct to call it a flat cone, with elements equal in length to the semi-diameter of the gun, and with the apex toward the front, and distant only

about one inch from the plane of the base of the cone. Of the six 200-pounders and seventeen 100-pounders which were expended by bursting, four of the former and two of the latter gave way in this manner.

195. There were several examples of another peculiar fracture, also shown by the drawings, where the guns gave way laterally, just in front of the reinforce, by the blowing out of an oblong piece, which sometimes extended back well under the reinforce, without displacing or injuring the latter, and without causing any cracks or evidences of strain elsewhere. Such a fracture might be assisted, and indeed occasioned, by the bursting of a shell in the bottom of the bore, but it is known that in a majority of the cases which occurred on Morris Island there existed no such initial cause.

One 200-pounder and seven 100-pounders burst in this manner. The 200-pounder was only cracked. The piece did not come off.

196. As a rule, the wrought-iron reinforce was not broken or split open by the bursting of the gun, but retained its form and dimensions. There were four exceptions to this, viz., one 200-pounder and three 100-pounders. Two of these reinforces split into three pieces, and the others into but two. When the gun broke off under the reinforce the latter remained intact upon the front or largest piece in all cases except one, (a 100-pounder,) when it adhered to the breech, and was detached with it, without breaking.

197. The unequal or uncertain powers of endurance of the Parrot rifled guns of large calibre (6.4-inch and 8-inch bores) is a matter which should, and doubtless will, command the earnest attention of the inventor and manufacturer. When costly guns become expended, under the ordinary circumstances attending their use in the field, before they have stood one-third or even one-fifth the service expected of them, the cause of the deficiency should be ascertained, and, if possible, a remedy applied. Whether the fault is attributable to practical difficulties necessarily connected with the mode of manufacture, in its application to large guns; to varying or capricious properties in the metal used; to inherent defects in the form given to the gun; or is the resultant of some or all of these several and distinct causes, seems to be a question of some doubt.

198. The fact that Parrott's guns of small calibre (his 30, 20, and 10-pounders) possess sufficient, and indeed, so far as my observation has extended, very high powers of endurance, is one of capital importance, as it confines the defects to the large calibres, and points to practical difficulties encountered in the fabrication as their probable cause, rather than to any fault in the form of the piece, or to the inferior quality of the metal used.

199. Why are Parrott's large rifled guns far less enduring, as a rule, than his 20 and 30-pdrs., particularly the latter? Why are some seriously deficient in endurance, while others possess much more than an average degree of

this requisite quality? Is it because the wrought-iron reinforce fails to perform its appropriate functions in all cases? Is there any insurmountable practical difficulty in shrinking it upon the piece with precisely or approximately that degree of tension necessary to secure the maximum strength consistent with such a combination of the metals, and with the form and dimensions adopted for the gun? We know that metals do shrink unequally in cooling, and that it is absolutely impossible to secure exactly the same amount of contraction in equal sized pieces of the same metal, even when manipulated under circumstances to all appearances identical. It is not possible, except in fluid, to heat a piece of metal uniformly through.

200. A very trifling inequality in the contraction of two hoops would occasion a marked difference in the strain upon the metal of those hoops, and, of course, in their compression of the metal of the guns. In proportion as the tension upon the reinforce approximates to its ultimate strength, is its capacity to sustain tension and relieve the strain upon the gun due to the firing, diminished.

201. It is not, however, to a want of strength in the reinforce, that the premature bursting of Parrott's guns is to be attributed, for the reason, already given, that that is not where the guns generally fail. The defect has been more prominently exhibited in the cast-iron.

202. No proof is needed of the premise, that if the

wrought-iron hoop is shrunk upon the gun much too tightly, both its strength and that of the cast-iron are injured thereby; while if too loose, it fails to afford the requisite support. In either case the gun would be deficient in endurance.

203. The breaking in two of the gun under the hoop by a simple fracture at right angles to the axis of the bore, which was a case of frequent occurrence, would seem to indicate either that the strength of the cast-iron had been impaired by undue compression, or, what is more probable, that the gun was not of sufficient thickness to afford adequate longitudinal strength.

204. Those cases, also quite frequent, where the guns gave way laterally, just in front of the band, by blowing out an oblong piece, would indicate that the band did not extend far enough forward.

205. My own opinion, based mostly upon personal observation, is, that without materially increasing the weight of the band it ought to reach about two calibres farther to the front, and terminate in a gradual taper. If the band be made to extend sufficiently far to the front to give the needed support at the place where so many of the Parrott guns fail, by yielding laterally between the band (as now made) and the trunnions; and if, in addition to this, that part of the gun embraced by the band be made with a very moderate taper toward the breech, say one inch in twenty-five, and the band be then quickly screwed to its position like a nut, by

means of machinery, so as to be in a condition to oppose some positive resistance to a longitudinal strain, the strength of these large rifles would doubtless be very much increased. The band should, of course, be screwed on while hot, and should cool with the gun in an upright position. The advantage of a uniform temperature would be secured by heating it in oil. I would suggest that the gun be cast hollow, and rifled with a uniform twist, or a twist of uniform pressure against the bands.

206. These remarks have been suggested by an actual service experience with these guns, not only extensive and varied, but indeed unsurpassed, and are submitted in the hope that the intelligent attention and well-known skill of the inventor, as well as of other practical mechanics who have made the fabrication of cannon a special study, will be earnestly directed to this matter.

AMES' WROUGHT-IRON GUNS.*

207. Within the last thirty years there have been numberless unsuccessful attempts to make good wrought-iron guns of *large* calibre. Various methods of manipulation have been tried, but, until quite recently, they have all ended in failure, more or less complete. With

* A description, in considerable detail, of Ames' guns, and the method pursued in making them, has already appeared in the public prints of this country, otherwise the information here given would have been withheld.

regard to the *small* calibres, the efforts have been attended with more success. Wrought-iron field-pieces are now in general use in our armies.

208. Mr. Horatio Ames, of Falls Village, Connecticut, is the inventor and manufacturer of a wrought-iron gun, by a process which seems to render the size and calibre of the piece a matter in a great measure independent of the practical difficulties of fabrication.

209. The gun is formed by welding together, in succession, a series of wrought-iron disks and rings. The disks are used to form the solid portion of the gun at the breech, and the rings that portion containing the bore. The construction of the gun is commenced at the cascable.

The rings for forming the largest part of the gun are each compounded of three concentric rings, accurately turned and fitted together. The compound rings are turned to precise shape on their faces before the final welding to construct the gun takes place. The center, or inner ring, projects slightly beyond the plane of the other two, in order to render certain the perfection of the welding next the bore. This brief description will be better understood by reference to Plate XXXIX.

Fig. 1 represents a section through the axis of the gun, and shows the several compound rings of which the gun is made.

Fig 2 is a section through the axis of one of the

compound rings, and shows the relative thickness of the three concentric rings of which it is formed.

Fig. 3 is a section of one of the compound rings at right angles to the axis of the bore.

210. Ames' guns have been put to very severe experimental tests at the Washington naval ordnance yard and elsewhere; none have yet bursted. A rifled 50-pounder, weighing five thousand six hundred and thirteen pounds, calibre 5.1 inches, density 9,671, and tensile strength 66,175, was fired with three and a quarter pounds of powder, and shell and shot weighing thirty-seven and three-quarters pounds. At the sixteen hundredth round the firing ceased, and the official report closes by saying that the firing was discontinued "on account of rapid increase of vent." The vent was not *bouched*, and no further trial of its endurance was made, so that we are still ignorant of the real merits of the piece. The report upon the trials with this piece contains the following remark:

"A *cast-iron* 30-pounder stood two thousand rounds without bursting, the model being the same as the gun made by Mr. Ames." This is calculated to convey the idea that Ames' gun was tested to its limit of endurance, although the record does not show such to have been the case.

211. Another of these guns, of the same dimensions as the one just mentioned, but bored for an 80-pounder,

was tried at the Washington navy yard. The trials stopped at the four hundred and thirty-eighth round, but the gun did not burst.

212. Another of these 50-pounders (an imperfect one) was tried at the foundry in Connecticut, with the intention to burst it. The following are the reported results. The piece rested on skids eight inches above the ground.

First round, twelve pounds of powder and a one hundred pound ball; second round, sixteen pounds of powder and a three hundred pound bolt; third round, twenty pounds of powder and a four hundred and fifty pound bolt. The gun recoiled from the blocks supporting it thirty feet; bolt went through two mounds of earth ten and twelve feet thick respectively, and then eighty rods beyond.

Fourth round, twenty pounds of powder and a two hundred pound bolt; loaded so that the bolt projected from the muzzle one inch, with the end resting firmly against a block of cast iron weighing two thousand eight hundred pounds. Gun recoiled sixty feet. The cast iron block, which was 36 inches × 20 inches × 20 inches, went through a bank of earth twelve feet thick and forty feet beyond.

These severe tests produced no visible effects upon the piece, and did not appear to have impaired its powers of endurance.

Plates XXXV., XXXVI., XXXVII. and XXXVIII. exhibit drawings of Confederate shot and shells picked up on Morris Island.

213. The experience of this war, sustained by recent trials in this country as well as in Europe, has developed the fact that no rifle guns of large calibre have yet been made and put into service, possessing sufficient powers of endurance to stand, *with certainty*, eight hundred, or even five hundred rounds, fired with a service charge of between one-ninth and one-tenth the weight of a solid elongated projectile suitable for the gun.

What the service demands is a gun strong enough to sustain the repeated shock of at least one thousand charges of powder, in as large quantities as can be burned with useful effect behind the projectile, and at any required elevation. If Mr. Ames' claim to have produced such a gun by his peculiar method of forging be verified by trial, its cost (eighty-five cents per pound, based on the prices of 1860,) should scarcely be deemed an overruling objection to its general adoption in the service.

The average number of rounds sustained by Parrott's 100 and 200-pounders on Morris Island, excluding those in which the bursting could be traced to the premature explosion or breaking of a shell, was three hundred and ten.

The cost per pound of Ames' largest guns is about six times that of Parrott's 8-inch rifle. Its calibre is seven inches, and it weighs 19,400 pounds.

*Cost of Guns.**

Name of Gun.	Material.	Bore.	Weight.	Cost per pound.	Total cost.
		in.	lbs.	cts.	$
Armstrong 10½-inch gun.	Wrought-iron coils in hoops	10.5	26,880	33.6	9,000 00
Armstrong 110-pdr. gun.	Wrought-iron coils in hoops	7.	9,184	23.9	2,195 75
Horsfall gun	Wrought-iron forged solid	15.	53,846	23.2	12,500 00
Alfred gun	Wrought-iron forged hollow	10.	24,094	20.7	5,000 00
Krupp's 15-inch gun †	Cast-steel forged solid.	15.	33,600	87.5	29,400 00
Krupp's 9-inch gun	Cast-steel forged solid.	9.	18,000	56.2	10,125 00
Bessemer forging	Cast-steel forged solid.	7 to 8	11,200	13.0	1,456 06
Blakely 12-inch gun	Cast-steel hooped with steel	12.	40,000	87.5	35,000 00
Blakely 11-inch gun	Cast-steel hooped with steel	11.	35,000	78.5	27,500 00
Blakely 10-inch gun	Cast-steel hooped with steel	10.	30,000	58.3	17,500 00
Blakely 120-pdr. gun	Cast-steel hooped with steel	7.	9,600	62.5	6,000 00
Whitworth 120-pdr. gun.	Cast-steel hooped with steel	7.	13,440	37.2	5,000 00
Parrott 100-pdr. gun	Cast-iron hooped with wrought-iron	6.4	9,700	12.4	1,200 00
Parrott 8-inch gun	Cast-iron hooped with wrought-iron	8.	16,800	14.1	2,300 00
Parrott 10-inch gun	Cast-iron hooped with wrought-iron	10.	26,500	17.0	4,500 00
Rodman 15-inch gun	Cast-iron cast hollow	15.	49,100	13.2	6,500 00
Rodman 10-inch gun	Cast-iron cast hollow	10.	15,050	9.75	1,466 00
Rodman 8-inch gun	Cast-iron cast hollow	8.	8,465	9.75	825 00

* From Alexander L. Holley's work, now in press.

† This is the weight and price unofficially reported. The price is probably not far wrong.

214. A safe and advantageous arrangement and distribution of the materials of a large cast gun—particularly of a rifle gun—to enable them to sustain the successive strains and shocks to which they will be subjected in firing, is incompatible with the condition that the gun shall be composed of a single piece of homogeneous metal. With forged guns of good wrought-iron, like that from Salisbury, Connecticut, the case is somewhat different, particularly if the workmanship be such that the piece will not first give way at the welds. The great tensile strength and ductility of the metal are both brought into action. In firing, the bore of the gun rapidly receives a permanent enlargement, within the limit of rupture. The surrounding metal is thus placed under tension, and the piece strengthened to a certain extent. The further stretching of the bore, beyond the power of the metal to bear, is thereby prevented. In a wrought-iron gun there is very little enlargement of the bore after the first fifty rounds, if fired with heavy charges. Such guns should first be bored a little smaller—about two-tenths of an inch—than they are required to be, and should then be fired with a few large charges, and re-bored to the proper calibre.

215. The forces which act upon a gun, tending to destroy it, are due principally to the explosive force of the powder, and the expansion of the gun by heat.

216. In smooth-bore guns, the maximum force of the powder—or, in other words, the maximum pressure

against the sides of the pieces—is exerted but for a very brief time, and at the seat of the charge, while overcoming the inertia of the projectile.

217. In rifle guns, this maximum strain or pressure acts for a longer period, and over a longer portion of the bore, in consequence of the great and continued resistance of the projectile, due to the friction generated while taking the grooves.

218. Therefore, in rifle guns, the taper on the exterior, from the seat of the charge forward, should be less sudden, or, if hooped, the hoops should extend further to the front than in a smooth-bore gun. It has already been suggested that the bursting of eight out of twenty-three 100 and 200-pounder Parrott guns on Morris Island, by blowing out in front of the reinforce, was in consequence of the inadequate length of the latter.

219. It is known, from repeated experiments, that the distending strain upon the metal of a gun, at points equally distant from the muzzle—that is, within the same transverse circular section—varies inversely with the squares of the distances of those points from the axis of the bore. Thus, at five inches from the axis, the strain upon the metal would be about double what it would be at the distance of seven inches, or in the ratio of forty-nine to twenty-five.

220. If we suppose a cylinder to be made up of a great number of very thin concentric cylinders, in a condition of initial molecular repose, then the strain

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upon these several cylinders, due to any distending force equally distributed over the inner surface of the inner one, would vary inversely with the squares of their diameters.

Professor Treadwell illustrates this law of diminution in the following manner:

"If we make a cylinder of forty-one concentric hoops of equal thickness, disposed one within another, and exactly fitting, so that the particles of each hoop shall be in equilibrium with each other, the diameter of the largest being five times that of the smallest, then the force of each, beginning with the innermost, to resist distension, will be represented by the following numbers:

1,000	250	111	62
826	225	104	59
694	207	98	56
591	189	92	54
510	174	87	51
444	160	82	49
391	148	77	47
346	137	73	43
309	128	69	45
277	119	65	41
			40

221. There is another important fact deduced by mathematical calculation, and sustained by experiments in both this country and Europe, viz.: *that no increase of thickness, however great, can enable a homogeneous cylinder to sustain a distending pressure from within on each square inch, exceeding the tensile strength of a bar of the material one inch square.*

222. Hence it is useless to attempt to augment the strength of a gun by increasing its thickness beyond a certain point, "because," as Captain Blakely remarks, "in cast guns, (whether of iron, brass or other metal,) the outside helps very little in restraining the explosive force of the powder tending to burst the gun, the strain not being communicated to it by the intervening metal. The consequence is that, in large guns, *the inside is split while the outside is scarcely strained.* This split rapidly increases, and the gun ultimately bursts."

In other words, the exterior part of a homogeneous cast gun gives way to forces applied by *wedging* and *leverage*, and not to a transmitted tensile strain.

223. We see, therefore, how inadequately the hooping of old and nearly expended guns accomplishes the object in view, of conferring upon them additional powers of endurance, since the exterior hoop simply reinforces metal that has not only never had its strength impaired by use, but is not liable to be brought under any strain exceeding that which it is well able to bear, except a *splitting* from the inside, which a hoop can but feebly, if at all, restrain.

The only apparently effective way to utilize the strength of the exterior, unimpaired metal of a cast gun in which cracks have already appeared on the inside, is to replace a portion of the inside metal, throughout the entire length of the bore, by a tube of tough and elastic material, placed under slight compression by cooling the gun upon it.

224. *Initial Tension.*—We would conclude from the foregoing that if a gun be compounded of several thin concentric hoops, or cylinders, those on the exterior being under suitable initial tension, increasing according to a fixed law with their several distances from the common axis, so that the aggregate of the initial tension and transmitted strain, per square inch on each cylinder, would be just equal to the tensile strength per square inch bar of the metal, we would obtain a combination satisfying the requisite conditions of maximum strength against statical pressure; for a distending force which would rupture the inner cylinder, would rupture all the others at the same moment. The greater the number of cylinders, their aggregate thickness remaining constant, the greater would be the strength of the combination.

225. *Varying Elasticity.*—Let us take another view of the case. If the several thin cylinders be composed of metal possessing different degrees of elasticity, decreasing according to a fixed law from the interior toward the exterior, so that those on the inside would, by their greater elastic expansion, transmit externally a distending strain of such intensity that the metal of the several cylinders would reach the limit of elasticity at the same moment, we would then have a combination of maximum statical strength, so long as the strain was not great enough to give the metal a permanent *set;* that is, so long as the elastic limit was not exceeded. When that point is reached, the advantages of varying

elasticity partially disappear, and are replaced, in a measure, by those of varying tension.

226. A cannon compounded of many concentric cylinders, combined on either of the foregoing principles of *initial tension* or *varying elasticity*, although possessing great theoretical strength, and although capable in practice of sustaining great statical pressure from within, (great, indeed, in proportion to the number of cylinders used for a given aggregate thickness,) does not possess sufficient unity of form to withstand the repeated shocks of firing. While there must be, in some degree, a division of parts, in order that the conditions necessary to resist statical pressure may be imposed to a certain extent, there must also exist in cannon the requisite continuity of mass and structure, to resist the instantaneous wave of force and other vibrations created in firing. Cannon are seldom constructed of as many as four cylinders; generally of not more than two or three.

227. Captain Blakely has attempted to combine the distinct advantages of *varying elasticity* and *initial tension* by using three tubes. The two inner tubes are of steel, that possessing the greatest elasticity forming the bore, while the outer tube is of cast-iron, on which the trunnions are cast. The tubes are shrunk together, so that the outer one is under slight initial tension. The elastic limit of the inner steel is thus favored by bringing it under slight compression. Even should the steel tubes become permanently strained, the gun, if properly

constructed, would not be weakened thereby, as the effect would be simply to increase the tension upon the cast-iron jacket. Captain Paliser makes use of this principle in bringing his large guns under suitable tension on the exterior. He makes the inner tubes of soft metal, the most ductile one containing the bore, and then fires the gun with a charge that will permanently stretch the inside. The gun is then finished by reboring to the proper calibre. Of course the exterior cylinder is thus placed under initial tension.

228. Major Rodman of the ordnance department United States Army recommends a method, now extensively followed, for placing the metal of cast-iron guns under the proper conditions of initial tension, by casting them hollow and cooling them from the inside; a process which is inapplicable to steel guns, which have to undergo annealing.

229. In 1856 Professor Treadwell proposed a method of "constructing cannon of a large calibre," of several tubes, the inner one, containing the breech, being of cast-iron about half a calibre in thickness. Upon this he placed "rings or hoops of wrought-iron, in one, two, or more layers," by screwing them on. For that purpose a screw or thread was cut upon the exterior of the inner, or cast-iron tube, and upon the interior and exterior of the other tubes, except the outside of the outer one. The hoops are about one-thousandth part of their diameter less than the parts they envelop, and are

screwed to their places while hot, to secure the proper tension.

230. Whether the tubes of a compound gun should be put together on Professor Treadwell's plan, with screws, or whether a more simple and less expensive method of combination will give the requisite unity of form, is still a question of discussion. For reasons which will not be given here, it is believed that screws are unnecessary, especially if the trunnions are placed upon the outer tube, as in the Blakely and Whitworth guns.

231. *Effects of Heat.*—The heat, generated by the burning charge, induces or increases compression on the inside and tension on the outside of a gun; and therefore, within certain undefined limits, strengthens the piece against a distending strain. Another kind of strain is brought upon the exterior of the gun by the expansion of the bore longitudinally. Against this, a gun composed of two or more tubes can accommodate itself, with less danger of injury to the exterior than if made from a single piece of metal, for the interior tube, instead of forcing the exterior to elongate with it, or yield to rupture, slips through it.

232. The composition of the armament of land batteries for channel defence, in the present condition of the great question of ships against forts, should, of course, have special reference to the defence against armored vessels. The best proportion for the two kinds—rifles

and smooth-bores; the most advantageous calibre for smooth-bores, whether large or medium size, or a mixture of both; are questions upon which a diversity of opinions exist among military and naval men. The invention of a large gun of 12 or 15-inch calibre sufficiently strong to be used effectively as a rifle, and rifled in such a manner as would not impair its qualities as a smooth-bore, would be a great advance in artillery. With such a gun, heavy elongated projectiles would be used with comparatively low velocities, at either long or short range, for their smashing effect upon armor; while solid steel or cast-iron spheres, and bolts and long percussion shells at high velocities, would be very destructive in cutting and punching through armor, and also upon the men and guns and machinery inside.

Batteries for channel and harbor defence should contain some—but in what proportion I am not prepared to suggest—of the largest calibres that can be manœuvred with ease and rapidity. For cutting through unimpaired armor at short ranges, in order to reach vital parts within as quickly as possible, smaller calibres are better, as they will stand greater relative charges, and yield higher velocities safely.

Principal Experiments on Smashing and Dislocating Armor, chiefly by Heavy Shot at Low Velocities. (From Alexander L. Holley's work, by permission.)

No.	Character of Gun.	Range. Yards.	Weight of Projectile. lbs.	Character of Shot.	Charge. lbs.	Velocity, in Feet.	Iron in Target. Inches.	Wood Backing. Inches.
1	15-in. Rodman s. b.	200	400	Cast-iron cored sphere.	40	Initial, about 1,000	4½ in × 3½ × 15 ft. solid, and 5 plates 1.1 each = 10 in. iron.	20
2	15-in. Rodman s. b.	50	400	Cast-iron cored sphere.	60	Initial, 1,480	6 in. solid plate.	30
3	11-in. U. S. N. s. b.	200	169	Cast-iron solid sphere.	30	Initial, about 1,400	4½ in. × 3½ × 15 ft. solid, and 5 plates 1.1 each = 10 in. iron.	20
4	11-in. U. S. N. s. b.	50	169	Cast-iron solid sphere.	30	Initial, 1,400	14-in. target 7 ft. square. 6 plates of 1 in., 1 of 4 in., and 4 of 1 in.	None.
5	13-in. Horsfall s. b.	120	279.5	Cast-iron solid sphere.	25	.....	4⅛ in. solid, 2,000 lbs. weight.	None.
6	13-in. Horsfall s. b.	800	279.5	Cast-iron solid sphere.	74.4	Initial, 1,631. Ricochoted.	Warrior target. 4½ in. solid, ⅝-in. skin, and Warrior ribs.	18
7	13-in. Horsfall s. b.	800	279.5	Cast-iron solid sphere.	74.4	Striking, 1,300	Warrior target.	18
8	13-in. Armstrong rifle.	1,000	610	Elongated steel shell.	70	About 1,200	Warrior target.	18
9	13-in. Armstrong rifle.	200	344.5	Spherical steel ball.	90	1,760	11-in. solid plate 41 × 24 in.	Two 12-in. Oak posts.
10	10½-in. Armstrong s.b.	200	150	Cast-iron solid sphere.	40	Striking, 1,586	Warrior target.	18
11	10½-in. Armstrong s.b.	200	162	Wrought-iron sphere.	50	Striking, about	Scott Russell's target. 4½-in. plate	

11	10½-in. Armstrong a.b.	200	162	Wrought-iron sphere.	50	Striking, about 1,600	Scott Russell's target. 4½-in plate and iron backing of three 1-in. and two ½ plates. No bolts. Continuous riveted ribs between plates.	None.
12	10½ in. Armstrong a.b.	200	162	Wrought-iron sphere.	50	Striking, about 1,650	Minotaur target. 5½-in. plate, ½-in. skin; Minotaur ribs.	9
13	10½ in. Armstrong a.b.	200	150	Cast-iron sphere.	50	Striking, about 1,600	Minotaur target.	9
14	10½-in. Armstrong a.b.	200	150	Cast-iron sphere.	50	Striking, about 1,650	Chalmers' target. 3½-in. plate backed by ½-in. plates on edge, 5-in. apart, and wood between, (this backing 10½ in. thick,) resting on 1½-in. plate, 3½-in. wood, and ½-in. skin.	.....

No.	Result.
1	4½-in. plate broken through; others indented a little. Nearly all bolts broken and jerked out; wood crushed a little; target violently shaken.
2	Target cracked, smashed, and completely penetrated.
3	4½-in. plate broken through. Indent, 3½ in. deep. About half the bolts broken, and a few thrown out.
4	Slight local effect. Target framing and sea-wall moved bodily several inches. Nearly all bolts broken and loosened.
5	9 balks of 14-in. timber formed a partial backing. Plate broken and scattered. Balks driven into sandbank.
6	Smashed plate and backing; tore skin and broke 7 bolts and 2 ribs. Did not go through.
7	Broke off corner 2×1½ ft.; started 2 bolts; doubled up a rib; shook target. Damage extended 5 ft. down.
8	Shell burst in passing through; hole through target 20×24 in.; plate started; many bolts broken, and target slewed round.
9	Plate broken in two; supports splintered; ball flattened and thrown toward gun.
10	Bulged and crushed plate over a surface of 3 or 4 sq. ft.; bent ribs; tore skin; broke several bolts and lodged in backing. Where the plate was backed with beams 2 ft. sq., similar shot did less local damage; but target and masonry shaken.
11	Hole broken through front plate; 2 ft. riveting sheared off; vertical rib and skin broken; shot thrown forward; whole structure moved back ½ in.
12	After No. 13 and two other shots clean through, smashed hole and lodged in it; backing smashed; no hole through; 2 ribs and 4 bolts broken; local effect less than No. 13; effect distributed on masonry in rear; target much shaken.
13	Smashed a disk out of plate 13 in. into backing; plate driven in 1 in.; 6 bolts and 11 rivets started; 2 ribs broken; horizontal girder carried away; general strain and bend
14	After a punching shot, smashed indent 11 in. deep; broke 2 bolts and 5 rivets; bulged out 2 ribs and backing.

Experiments on Smashing and Dislocating Armor. (Continued.)

No.	Character of Gun.	Range. Yards.	Weight of Projectile. lbs.	Character of Shot.	Charge. lbs.	Velocity, in Feet.	Iron in Target. Inches.	Wood Backing. Inches.
15	10½-in. Armstrong s.b.	200	150	Cast-iron sphere.	50	Striking, about 1,650.	Chalmers's target.	.....
16	7-in. Whitworth rifle.	200	150	Elongated steel.	25	At 563 ft. 1,241	Inglis's target. 8-in. vertical and 5-in. horizontal slabs, and 7-in. vertical and 5-in. horizontal slabs, 9×5-in. ribs, and 3-in bolts. No wood.	.....
17	10½-in. Armstrong rifle.....	200	230	Elongated conical cast iron.	45	At 562 ft. 1,400	Inglis's target.	.....
18	10½-in. Armstrong rifle.....	200	307	Elongated cast-iron.	45	At 563 ft. 1,228	Inglis's target.	.....
19	10½-in. Armstrong rifle.....	200	301	Elongated conical steel.	45	Striking, 1,293	Brown's target. Upper plate 5½-in., middle plate 7½ in., lower plate 6½ in. 2½-in. skin behind backing on one side. Iron ribs and horizontal girder.	10 behind one side.
20	10½-in. Armstrong rifle.....	200	300	Elongated cast-iron.	35	.....	Bellerophon target. 6 in. solid; 1½-skin; heavy ribs.	10
21	9.22-in. Armstrong rifle.....	200	113	Wrought-iron sphere.	25	At 563 ft. 1,462	Inglis's target.	.....
22	7-in. Lynall Thomas's rifle.....	200	150	Elongated wrought-iron.	25	At 563 ft. 1,218	Inglis's target.	.....

23	9-in. Lynall Thomas's rifle.....	200	302	Elongated wrought-iron.	50	Not ascertained.	Brown's target.	.....
24	9-in. Lynall Thomas's rifle.....	200	330	Hardened steel bolt.	50	At 563 ft. 1,220	Brown's target.	.....

No.	RESULT
15	After 2 shots, smashed indent 12 in. deep and broke up; 2 bolts, 3 rivets, and 1 rib broken; corner of plate struck and detached; skin cracked.
16	After 5 shots, struck an 8×24×21-in. plate under embrasure; bent 9×5-in. rib previously started; broke 2 bolts; threw out one; cracked both plates and drove in front plates 1 in.
17	After 2 shots, cracked 7-in. and 5-in. plates, and bent, drove in, and dislocated them and the ribs; several bolts broken; indent, 1½ in.; no plates thrown off.
18	After 5 shots, struck joint near Whitworth No. 16; cracked plate, broke, and threw out a bolt; bulged and shook planks and frame-pieces considerably.
19	After 3 rounds with 68-pounder and 3 with 65½-lb. 7-in. Armstrong rifle, shot struck over a rib; 13×6 in. indent in 7½ in. backed plate; a bolt and 20 rivets broken; bent plate and ribs; broke the horizontal girder, and shook the whole violently.
20	After 11 heavy and light shot, struck centre of plate; plate driven in 2 1 in. for 5 ft. and started out .4 in. for 2 ft., and crack 18 in. long; no through bolts or skin broken.
21	After 1 shot, indent 2½ in. cracked 8 in., and 5-in. plate; bent rib; broke 1 bolt; perceptible strain.
22	After 3 shots, indent 1.8 in. plate cracked and sprung, but not much shaken; shot much upset.
23	After 1 shot, struck junction of 7½ and 6½ plates not backed; indent 6 in. in 7½ ft. length; several cracks; several rivets and angle-irons and a vertical rib broken; shot rebounded 25 yards; shot much upset.
24	After 2 shots, smashed a piece 21×12 in. out of 7½-in. plate not backed; shook horizontal girder out of place; broke one and bent 2 ribs; 2 bolts broken.

Principal Experiments with Shot at High Velocities, and Shells against Solid Armor.

NOTE.—This table represents the maximum penetrating power of Ordnance, since much thicker laminated armor has been punched by both similar and lighter shot at lower velocities.

No.	Character of Gun.	Range. Yards.	Weight of Shot. lbs.	Character of Projectile.	Charge. lbs.	Velocity, in Feet.	Iron in Target. Inches.	Wood Backing. Inches.
1	15-in. Rodman s. b.	Ab't 50	400	Cast-iron solid sphere.	60	1,480	6 in. solid French plate.	30
2	13-in. Armstrong rifle.	1,000	610	Elongated steel shell.	70	About 1,200	Warrior target. 4½ in. solid, ½ in. skin, 18 inch iron ribs.	18
3	13-in. Horsfall s. b.	200	275.5	Cast-iron solid sphere.	74.4	Initial, 1,631	Warrior target.	18
4	11-in. U. S. N. gun.	30	168	Cast-iron solid sphere.	30	Initial, about 1,400	4½ in. solid plate.	12 in. facing, 20 in. backing.
5	10½-in. Armstrong s.b.	200	150	Cast-iron solid sphere.	50	Striking, 1,600	Warrior target.	18
6	10½ in. Armstrong s.b.	200	150	Cast-iron solid sphere.	50	Striking, 1,600	Minotaur target. 5½ in. plate; ½ in. skin behind backing; 18 in. iron ribs.	9
7	10½-in. Armstrong rifle.	200	301	Solid steel elongated shot.	45	Striking, 1,293	Chalmers's target. 3½ in. plate backed by ½ in. plates on edge 5 in. apart; wood between (this backing 10½ in. thick) resting on 1½ in. plate, 3½ in. wood and ½ in. skin.	.....
8	10½-in. Armstrong rifle.	200	288	Elongated steel shell. Bursting charge, 11 lbs.	45	Striking, 1,318	Brown's target. (See No. 13.)	.....
9	Whitworth rifle, (120-pdr.)	600	130	Elongated steel shell; 3 lbs. 8 oz. bursting ch.	25	Striking, 1,268	Warrior target. Inferior plate.	18

10	Whitworth rifle, (120-pdr.)	800	151	Elongated steel shell; 5 lbs. bursting charge.	27	Striking, 1,170	Upper plate, 4½ in.; 2 lower plates 5 in.; 2 bolts at edges. ⅝ in. skin.	18
11	Whitworth rifle, (120-pdr.)	800	151	Elongated steel shell; 5 lbs. bursting charge.	27	Striking, 1,170	Upper plate, 4½ in.; 2 lower plates 5 in.; 2 bolts at edges. ⅝ in. skin.	18
12	Whitworth rifle, (120-pdr.)	800	130	Elongated steel shell; 5 lbs. bursting charge.	27	Striking, 1,227	Upper plate, 4½ in.; 2 lower plates 5 in.; 2 bolts at edges. ⅝ in. skin.	18
13	Whitworth rifle, (120-pdr.)	200	148	Elongated steel shell; 5 lbs. 12 oz. bursting ch.	25	Striking, 1,268	Brown's target. Upper plate, 5½ in.; middle, 7½ in; lower, 6½ in.; iron ribs and horizontal girder. 2½ in. skin behind backing on one side.	10 in. behind one side.

No.	Result.
1	Target completely penetrated, and badly smashed.
2	Shell burst in passing through; hole through target, 20 × 24 inches; plates started; bolts broken.
3	2½ ft. ragged hole through target; broke 3 ribs and 20 bolts; plate struck not buckled.
4	15½-in. hole through target, and 3 ft. 6 in. into bank; most of facing thrown off; 2 bolts broken.
5	11-in. hole through entire target.
6	12½ × 13-in. hole through the target.
7	Struck junction of plates. 13 × 14½-in. hole through front, 1½ × 2 ft. through backing; rib broken.
8	Clean hole in 5½-in. plate, and burst in backing, setting it on fire, and tearing open skin and breaking rib.
9	Clean hole through; burst in backing, setting it on fire; débris driven through skin; oakum fired; 1 rib broken.
10	8-in. hole in 5-in. plate, and through all, shell burst outward and inward. No damage within.
11	Penetrated 4½-in. plate over rib, driving it out; shell burst passing through skin; 46 pieces of shell and skin scattered between decks.
12	Penetrated 5-in. plate; 14-in hole at back; burst in skin; fragments driven through.
13	Struck near the 288-pdr. (No. 8); burst in backing and blew it out at top; skin opened.

GREEK FIRE.

233. The composition of Short's "Solidified Greek Fire" I am unable to give. It was the only incendiary material called "Greek Fire" which we attempted to use against the city of Charleston.

Captain Mordecai reports as follows upon it: It was furnished in tin tubes, closed at one end, about three inches long and three-quarters of an inch in diameter. These tubes were covered with one layer of paper, such as is commonly used for cartridges. The paper was folded down over the ends of the tube, that part covering the open end having upon it a priming of powder and coal tar.

The directions for using this fire were furnished from the manufactory, and were as follows: "As many of the cases containing this composition must be dropped into the shell as it will hold, with as much powder as can possibly be shaken among them."

After the failure of shells filled in this manner to give satisfactory results, Mr. Short visited Morris Island. He altered the manner of filling the shell, putting several inches of powder in the shell before inserting the cases. He also covered some cases with several thicknesses of thick cartridge paper, and others with several layers of muslin.

Into all the shells filled by him powder was first placed.

Results of Experiments with Short's Solidified "Greek Fire."

No. of Shots.	Projectile. Shell.	Manner in which filled.	Charge.	Fuze.	Elevation.	Remarks.
10	200-pdr.	20 pieces in each, and 3 pounds of powder.	18	Per.	32°	Well.
5	200-pdr.	30 " " " 3 " "	18	"	32°	Burst in gun.
1	100-pdr.	24 " " " 2 " "	10	"	35°	" "
1	100-pdr.	24 " " " 2 " "	10	"	35°	
1	30-pdr.	12 " " " 1½ " "	3½	"	30°	Well. Heaving it.
7	200-pdr.	Full, and powder shaken in.	16	"	12°	All burst in gun, or shortly after
1	10-in. mor.	Filled by Mr. Short.	1	10″	45°	Struck before fuze burnt out.
1	10-in. mor.	" "	1	10″	45°	Well.
1	30-pdr.	" " cases covered with one thickness of paper.	3	5″	3½°	Did not burst.
1	30-pdr.	" " " " " " " " "	3	5″	5°	Burst 150 yards from gun.
1	30-pdr.	" " " " " " " " "	3	5″	5°	Burst in 5 seconds.
1	30-pdr.	" " " " " several thicknesses of paper.	3	5″	5°	" " 5 "
1	30-pdr.	" " " " " " " " "	3	12″	12°	" " 12 "
1	30-pdr.	" " " " " " " " "	3	12″	12°	Did not burst.
1	30-pdr.	" " " " " layer of muslin.	3	12″	12°	Burst in 12 seconds.
1	30-pdr.	" " " " " " "	3	5″	5°	" " 5 "
1	30-pdr.	" " " " " " "	3	5″	5°	" " 5 " (tumbled.)
4	30-pdr.	" " " " " " "	3	Per.	12°	" in gun.
1	30-pdr.	" " " " " " "	3	"	12°	" "

NOTE.—The premature explosion of shells filled with "Greek Fire" is doubtless caused by the heat generated by the friction between the interior surface of the shell and the tin cases, due to the sudden rotary motion imparted to the projectile. I do not believe Short's Greek Fire possesses any special merit over several other incendiary mixtures familiar to pyrotechnists.—Q. A. G.

To the best of my knowledge, the only cases in which shell were fired containing the "Solidified Greek Fire" are enumerated on the previous page.

This "Solidified Greek Fire," in intensity of heat, is surpassed by the common "port-fire" used in artillery.

FORTIFICATIONS.

234. The rapid breaching of Fort Pulaski in April, 1862, at the distance of one thousand six hundred and fifty yards, and the more recent demolition of Fort Sumter, with batteries, the nearest, and moreover not the heaviest of which, was three thousand four hundred and seventy-five yards distant from that work, have very naturally led to inquiries into the merits of masonry forts with exposed scarps, with their armament arranged tier above tier, which forms a most prominent feature in the system of works adopted, and now being constructed, for the defence of our important harbors, arsenals and depots.

235. It is believed that the modifications in the character of such works, called for by the newly developed powers of modern artillery, are mostly those of details, and not of principle. It is not impossible, but in fact probable, that some of our works, doubtless most judiciously located to meet all the essential requirements of defence, at the time when their construction was commenced, and before the invention of rifled ordnance, may not be on the sites where the present conditions of

the modified problem would place them, and consequently the construction of additional works or outworks may have become necessary, at points which formerly we might with impunity have allowed an enemy temporarily to occupy.

236. For works already constructed, it may, and probably will be necessary, to build earthworks, or use iron plating, to protect masonry that might, without much hazard, have been left exposed to the smooth-bore guns of former calibres.

237. For works yet to be constructed for channel and harbor defence, a judicious use of iron-clad masonry may afford the requisite degree of security to the guns, without involving us in exorbitant expense; but it is not improbable that the use of many-tiered casemated masonry forts, with exposed walls, will have to be restricted to localities that do not offer advantages pointing to other methods of construction, such as open or casemated earthworks, or Haxo batteries, with appropriate modifications. No important battery should be made to depend for its security on the unprotected masonry upon which it rests.

238. Military critics should keep in view the principle which has controlled the location and general character of our works for harbor defence, the office which those works are designed to fill, and the results which they are intended to secure. They are to forbid the passage of hostile naval force into our harbors, and up

to our arsenals, cities and depots, but are not expected to prevent the landing and moving of troops beyond the reach of their guns. Our defence against an attack or invasion by the land forces of an enemy, is to be found in the patriotism and valor of our volunteer soldiery. But our best and largest army, unless provided with suitable artillery, and cover for the men, could make no adequate defence against even one well armed vessel. Permanent shore batteries, armed with heavy guns, supply this defence.

239. The old maxims, that forts cannot withstand a competent land attack, but are able to resist and repel vessels, are maxims still, in their modified sense. They have, indeed, been amply illustrated during the present war.

240. Fort Pulaski fell before an attack from land batteries, breaching in the line of its principal magazine, while the probabilities of reducing it by the fire of the fleet was not even discussed among military and naval men at that time.

Fort Sumter, in April, 1863, repulsed in forty minutes, Admiral Dupont's gallant attack with nine ironclads, eight of which were of the most formidable class; and yet that work was demolished by shore batteries. It reflects no discredit upon our navy, to say that Fort Wagner, with its garrison covered as it was by a secure bomb-proof, and with facilities for keeping its supplies of men, ammunition, and guns, unimpaired, could never

have been reduced by a naval force, or by any other means than those adopted, viz.: by sapping up to the ditch of the work, and then assaulting, or threatening an assault, from the advanced trenches. On the 3d day of March, 1863, three turret iron-clads of the best class engaged Fort McAllister, mounting seven guns, on the Great Ogeechee, Georgia, for eight hours, inflicting but little injury on the work. Captain P. Drayton, commanding the naval force, says in his report: "Immense holes were cut into the earth, the traverses and faces much cut away, but still no injury done which a good night's work would not repair; and I do not believe that it can be made untenable by any number of iron-clads which the shallow water and narrow channel will permit to be brought into position against it."

241. Other examples might be cited. In those above given, two of the works were open sand batteries, in which the cannoniers were exposed to fire, and the guns were therefore liable to be temporarily silenced, as was frequently the case with Fort Wagner. For this reason the accumulation of guns in open works, exposed to the concentrated fire of a fleet, very materially impairs the defence. They should be distributed in batteries, each containing but a few guns, due regard being had to their security from capture by assault.

242. The marked difference in the practical results produced by rifle projectiles upon the two materials, brick masonry and compact sand, as exhibited on the

one hand in the rapid breaching of Fort Pulaski in April, 1862, and on the other in the failure to cut through into the bomb-proof shelter of Fort Wagner, presents an interesting subject for the study of the engineer and artillerist.

243. A hasty comparison of the two somewhat novel and startling facts developed on those occasions, viz., that one hundred and ten thousand six hundred and forty-three pounds of metal produced a breach in Fort Pulaski, which caused the surrender of that permanent and well constructed brick fortification, while one hundred and twenty-two thousand two hundred and thirty pounds of metal failed to open the bomb-proof of Fort Wagner, a sand work extemporized for the war, might lead to erroneous conclusions. It must not be forgotten, in this connection, that in the former case the brick wall stood nearly vertical, and all the débris formed by the shots immediately fell into the ditch, and no longer afforded any protection to the part of the wall left standing; while in the latter, the mass was so formed with flat slopes, that a very large proportion of the sand displaced by the successive projectiles, fell back again and again, within the area attempted to be breached. It is certainly within limits to say, that nine-tenths of the resistance to breaching, in this case, was due to portions of the covering that had already been several times displaced by previous shots.

If this covering had been composed of brick masonry,

the same form and dimensions being retained, the destructive effects of our projectiles would doubtless have been much greater than it was; for then every shot striking the bomb-proof, would, by mere force of impact, have thrown large masses of the masonry so far, that they could no longer afford any protection as a covering.

244. The powers of resistance of pure compact sand, to the penetration of projectiles, very much exceeds those of ordinary earth, or a mixture of several earths; and in speaking of earthworks, a capital distinction should be made between those formed of quartz sand and those that are not.

245. Against the destructive effects of projectiles, pure quartz sand, judiciously disposed, comports itself unlike any other substance, and for certain parts of fortifications its peculiar properties suggest its exclusive use, in preference to ordinary earth.

246. Those portions of earthworks not covered from the enemy's artillery at effective ranges, and upon the endurance or integrity of which depend the support and safety of valuable batteries, should be constructed of pure sand with natural slopes.

247. Indeed, in all permanent batteries, where the guns are disposed in one tier, the masonry scarp, unless covered against artillery by earth in front, or so far *detached* that its destruction will not necessarily involve that of the battery, had much better be omitted, and its

place supplied by a sand scarp and parapet with gentle slopes.

248. The developed powers of modern artillery require corresponding modifications in the engineer's art. Progress must be met with progress; art confounded with art; science set against science.

249. The old military maxim, that "*the masonry of forts should be covered from the enemy's land batteries,*" may not be sufficiently comprehensive to satisfy all the essential conditions of the modernized problem.

250. Our masonry scarps will have to withstand the shocks of the heaviest projectiles from batteries afloat. Can they do this without the protection of iron armor? If not, then the many-storied castle, of which the entire wall is exposed to the concentrated fire of an enemy's fleet, possesses an inherent and fatal element of weakness, inasmuch as it accumulates many guns in a small area, with inadequate means of protection. The only advantage of such an arrangement would appear to be economy in original outlay. There are positions, as at Fort Sumter, and the fort on the Rip-Rap shoals in Hampton Roads, where this method of construction has necessarily to be adopted, for want of room to make a more judicious distribution of the armament. At the Narrows, New York Harbor, the inadequacy of defence by masonry casemates has been promptly met and a judicious remedy applied. The shores are lined with earthworks mounting the heaviest guns.

251. Whenever a point, at which an important work for channel and harbor defence is to be established, presents a bank rising gradually from the water's edge, and affording every requisite advantage for arranging batteries upon the face of the slope, with any required command, tier above tier if desirable, and either open or in casemates covered and faced with sand, and therefore exposing no masonry to the enemy's fire, there would seem to be presented an opportunity for cutting loose from a custom resting upon opinions of questionable soundness, with a view to eliminate from the problem certain palpable elements of uncertainty and insecurity. The important and obvious condition that these batteries should be secure against capture by *coup de main*, can be imposed without piling the guns one over the other, behind and upon a destructible material like masonry.

252. The invention of rifle cannon, the astonishing increase within the last few years in the calibres of both rifles and smooth-bores, and the use of iron armor for batteries afloat and ashore, have relatively increased the power and efficiency of shore batteries, as defences against those afloat. This is evident for the following reasons:

First. There is no theoretical limit, and none in practice, except in the expense, to the thickness of the iron armor that can be put upon our forts and land batteries.

Second. There appears to be no limit to the size of

guns, either of wrought or cast-iron or steel, or a combination of them, that can be made and handled with facility on shore; while,

Third. There is both a theoretical and practical limit, already reached, to the weight and thickness of the iron armor that can be safely put upon vessels of war. There is doubtless also a limit to the weight of guns that can be carried and manœuvred with satisfactory rapidity on shipboard.

253. A revolving cylindrical turret, or even a half cylinder, (for it would not be necessary to completely surround the guns with iron armor in positions where the firing came from one side only,) containing two or three of our heaviest guns, would be a formidable means of channel defence. The guns could fire in any direction, and not be limited to a field of one-sixth the entire circle, as in our casemate embrasures. We could then reap all the advantages to be derived from long-range guns. In the defence of a strait channel by guns in turrets, we could get almost three times the field of fire of an embrasure gun, by placing the turrets four or five times their diameter apart.

The turret plan may not be the most economical method of applying iron armor to land batteries, but it would seem to combine more than any other the double advantage of long range and wide field of fire, besides giving almost entire security to the men and guns.

A simple iron parapet would doubtless be cheaper

than turrets, but for an equal number of guns would be far less effective. If the guns are placed in barbette, they would be too much exposed; if merlons are put between them for partial protection, their field of fire would be greatly reduced; and, in either case, the battery would be liable to be silenced by a concentrated fire of case-shot, grape, and canister.

ERRORS IN THE ENEMY'S DEFENCE.*

254. Fort Wagner affords a striking example of the injudicious location of an outwork. Its office was to hold and control possession of all that portion of Morris Island upon which effective breaching batteries against Fort Sumter could be established. We have seen how signally it failed to do so. The instructive and suggestive lesson of Fort Pulaski, which was lost to the enemy because Big Tybee Island, the proper position for a heavily armed outwork, was abandoned to us without an attempt being made to hold it, was not practically applied in defending the approaches to Fort Sumter.

255. After the primary error of abandoning Cole's Island,* therefore, the great mistake of the enemy, on that part of his line of defences which we attacked, was

* The enemy relinquished a great advantage when he evacuated the strong position of Cole's Island; for this step abandoned to us the undisputed occupation of Folly Island, and the control of Stono Inlet, and gave us a secure base, easily held, from which to threaten the defences of Charleston, whenever and as often as military reasons rendered it advisable or expedient to do so.

made by his engineer, and consisted in locating Fort Wagner near the north end of Morris Island, instead of on the sand hills two miles further south, near Light-house Inlet. He would not have been forced to witness the humiliating spectacle of the destruction of his principal work on an interior line, over the heads of the defenders of an exterior one, had Fort Wagner been even one mile further to the southward. With only one inclosed work for the defence of Morris Island, the proper location for it was near the south end. Its armament should have been defensive principally, and its strength of profile such as to enable it to resist a *coup de main* beyond peradventure. The heavy ordnance for channel defence, on the north end of the island, ought to have been arranged in one-gun or two-gun batteries, as they were on the south end. Too much dependence, however, was placed on these guns at the south end. Their resistance to our attack on the 10th of July was by no means formidable. A few light field pieces, judiciously posted, and secured against capture by assault, would have been far more efficient.

256. A proper and perfect defence of Morris Island would have been two small inclosed works, each heavily stockaded to resist escalade, and each armed with a few field and siege pieces, and several siege mortars. With one such work located on the site of Fort Wagner, and another on the high sand bluffs about two miles further south, no enemy could have maintained a lodgment on the island for an hour. The long-range guns for chan-

nel defence should have been placed in one or two-gun batteries, located so as to be seen in flank or reverse by the inclosed works.

257. On the erroneous hypothesis adopted by the enemy, that he did not deem it necessary to hold all of Morris Island, and considered Fort Sumter safe, so long as he kept us away from Fort Wagner, the latter work was as judicious in its location, as it was formidable in its construction. But in that view of the case, which our subsequent operations proved to be singularly short-sighted and faulty, the batteries of heavy guns for channel defence ought to have been kept within reach of Wagner's protecting fire, and not placed over two miles distant from it, as were many of those we captured on the 10th of July. A wise defence would have kept us off Morris Island entirely, as the simplest and least expensive method of solving the problem.

258. A striking example of the fatal consequences that may ensue, from an undue accumulation of heavy artillery for harbor defence in small earthworks, is to be found in the attempted defence of Port Royal harbor by the enemy in November, 1861. All his artillery on that occasion was collected in two small forts, one on each side of the harbor. Into these our fleet, in its circuits within the harbor, poured successively an overwhelming and concentric fire, and drove the enemy from them by sheer weight of metal, before the works themselves had sustained any material injury. There were

no bomb-proof shelters for the men in either work. Had the enemy's artillery been distributed along the opposite shores, for a distance of four or five hundred yards, in batteries of one or two pieces each, the result, viewing the action as one between land and naval batteries simply, might have been quite different. As security against attack in rear by troops, the infantry supports should have been placed in strong inclosed works, in rear of the batteries.

259. The special defence of Fort Wagner was faulty in two particulars, viz.:

First. It was too passive. All the advantage that might have been derived from vigorous night sorties, against which the fire of the fleet could have taken no effective part with safety to us, was voluntarily relinquished when the system of defence by torpedo mines, placed on and in advance of the glacis, was resorted to.

Second. Curved fire was not used enough. The armament of the work contained but two mortars, (one 8-inch and one 10-inch.) These, when earnestly served, caused the most serious delay in the progress of our work, and on one occasion suspended it entirely.

260. The coehorn mortar is a most valuable weapon in siege operations. From its lightness and portability, it is peculiarly well adapted to the attack, and should follow close on the heels of the sappers. In this manner it was used by us in the siege of Fort Wagner.

261. This leads to an inquiry into the military princi-

ples which controlled the issue of the contest for the possession of Morris Island under the peculiar circumstances of the case, as they existed after we made our lodgment there on the 10th of July, viz.: Our forces occupying one end of the island, without batteries or defences of any kind, except what were improvised from day to day; the enemy being upon the other end, strongly fortified; the narrowest part of the island (a mere strip of shallow sand, frequently overflowed by the sea,) being between the contending forces, and within half musket range of the powerful battery and numerous sharpshooters of Fort Wagner, and both parties having their communication to the rear open. Why did not the enemy drive us from the island, as their commander asserted should be done, instead of being driven from it themselves?

Two conditions, steadily maintained, achieved success for us, viz.:

First, An overpowering mortar fire from our batteries, particularly towards the end of the siege of Fort Wagner, opposed by a weak mortar fire from the enemy.

Second, The difference, always in our favor, except in rough weather, between the flank fire upon us from the James Island batteries, and the fire upon the enemy from our fleet, which could establish comparatively short ranges, and had considerable latitude in selecting positions.

These conditions induced the enemy to adopt an injudicious, because passive, defence. They depended mainly on torpedo mines for the security of their position. These would have been useful against open assaults, but should have been removed, to facilitate night sorties, as soon as we resorted to the slow attack by regular approaches.

262. While it would have been entirely practicable for us to have pushed forward our approaches to Fort Wagner without the co-operating fire from our gunboats, (with greater loss of men and material, of course,) their presence abreast of Morris Island helped to subdue the fire of Fort Wagner, and kept the gunboats of the enemy beyond range in the harbor, thereby saving us the time and labor of establishing batteries for that special purpose. This is simply the deliberate expression of an opinion entertained, it is believed, by all unbiased men of intelligence and military experience who witnessed the operations before Charleston. This statement involves no disparagement of the navy. On the contrary, the gunboats rendered most valuable assistance. The "New Ironsides," in particular, under the energetic command of Captain Rowan, was very efficient in subduing the fire of Fort Wagner.

263. Throughout the period occupied by the land forces in accomplishing their portion of the joint programme of attack, (see paragraphs 35, 36, and 37,) which in fact ended with the demolition of Fort Sumter on the 23d of August; and subsequent to this, until Forts

Wagner and Gregg were captured, on the 7th of September, the navy rendered all the co-operation that was necessary or that was desired of it.

264. Of the causes which prevented any attempt by the navy, to remove or pass the channel obstructions, and enter the inner harbor, I am not disposed to speak at any length. I will, however, refer to one or two events.

365. As soon as the labors of the siege of Fort Wagner were over, on the very day, indeed, (September 7,) Colonel Serrell, assistant engineer on my staff, had an interview with Admiral Dahlgren upon the subject of the channel obstructions. He was instructed to make an offer to the admiral of such men and means from the army, as might be required to remove them.

266. Colonel Serrell's experience and skill as an engineer, and his firm belief, in which I concurred, that a practicable channel could be opened through the obstructions, with no great delay or difficulty, and without serious loss of life, were the principal reasons why he was selected for this mission.

267. On his return, Colonel Serrell reported to me that the admiral considered the musketry fire, which, it was supposed, might be delivered from the ruins of Fort Sumter, as a most serious obstacle in the way of any attempt to remove the channel obstructions. The admiral subsequently expressed this opinion to me. Al-

though I did not share in this apprehension at all, fully believing that there would be no exposure that men, in the execution of important work, ought to shrink from, I nevertheless made ample preparations to effectually subdue any such fire, placing, for that special purpose, a heavy armament of guns and mortars on the north end of Morris Island. I entertained no doubt of satisfactory results.

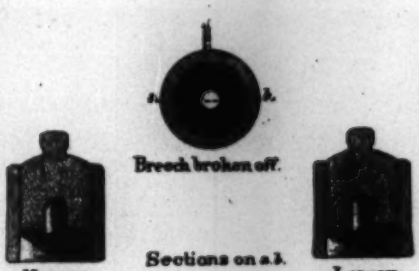
268. On the 26th of September I received a letter from the admiral, asking me when my batteries would "be able to operate on Sumter," and whether he could depend on my "driving the enemy out of it," and stating also, that "with Sumter in our possession, the obstructions ranging from that work to Moultrie, whatever they are, would be removable with no great trouble, and little risk."

I replied, on the 27th of September, that I would open on Sumter whenever the admiral was ready to move in, on the next morning, if it was desired.

269. As an open assault would be necessary to get "Sumter in our possession," and as we could not expect to hold it if we got it, until after the navy achieved success inside the harbor, occupying, as the work did, the centre of a circle, with the enemy's batteries on three-fifths of the circumference thereof, being unapproachable by land, and having each of its five faces exposed to both a direct and a reverse fire from the James Island and the Sullivan's Island batteries, and as

the sole and only object to be gained by our possessing it, was to relieve parties operating against the obstructions from the annoyance of its musketry fire, I made a distinct offer to the admiral, in my letter of September 27th, to undertake the removal of the obstructions myself, rather than incur an unnecessary sacrifice of life. This offer, the admiral, with great candor, declined, saying that that was his "proper work," and that all he desired was to have Sumter rendered incapable of its musketry fire by the fire from our batteries on Cummings Point when he was ready to move in, which might not be for a couple of weeks.

270. There were no guns in the fort to fear, and the practicability of keeping its musketry fire entirely silent, for an indefinite time, with the powerful armament we had ready for that purpose on the north end of Morris Island, was not doubted for a moment.



Breech broken off.

Upper.

Sections on a.b.

Lower.

Upper Side, Plane of vent.

Right Side, Fragment.

30^{lbs} GUN
Nº 193.
14.

Burst at 4.806th Round.

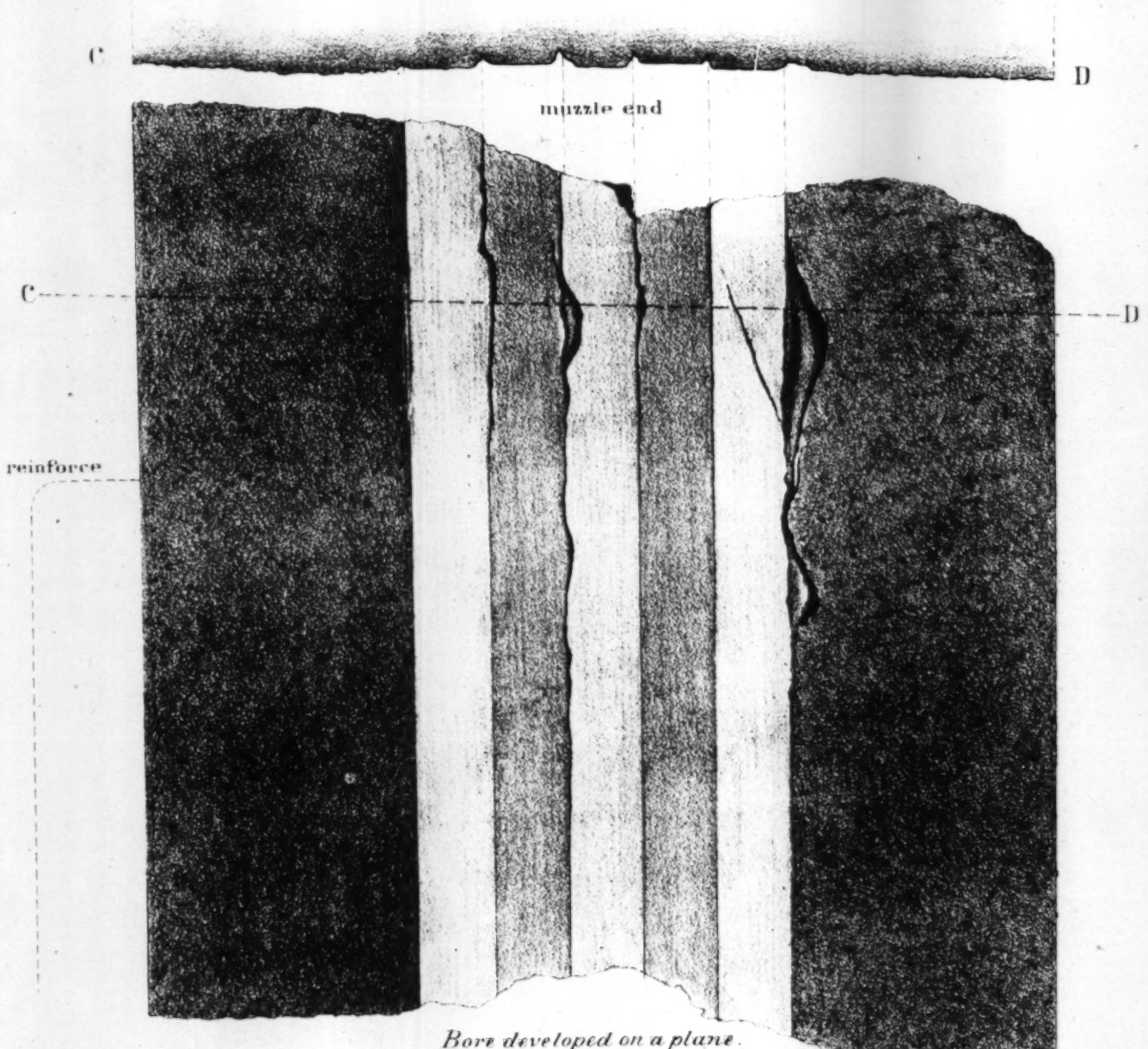
Greatest elevation used . 43° 30'
Lowest " " 40° 0'
Elevation when burst 40° 0'
Charge 3¼ lbs.
Bouched twice
4 rounds fired at 2° 30'
The gun was fired but once at an elevation greater than 40°.

For weight & dimensions see parag^{ph} 186.

(See Plate X and XI)

D. Van Nostrand Pub.

J. Bien, N.Y. Lith.



Bore developed on a plane.

One third of full size.

fracture, a horizontal plane, through the axis.

lower half.

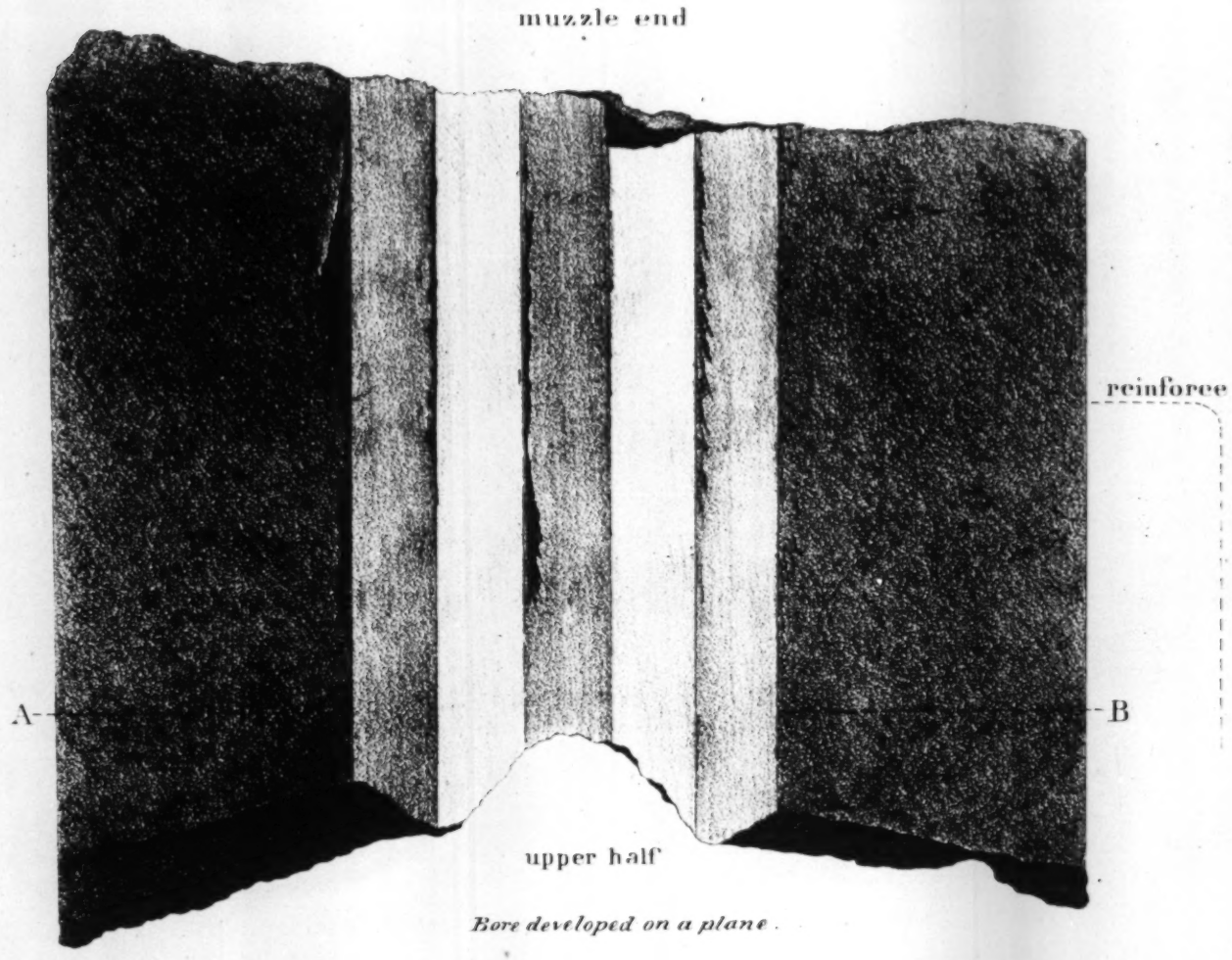
30 pdr. Parrott, calb. 4 2/10"

burst, 4606 round

max. elevation 40°. *(except one round at 49° 50')*

average " 40°.

(See Plate IX and XI.)



Bore developed on a plane.

One third of full size.

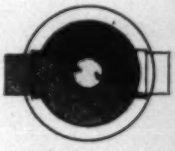
30 pdr. Parrott cal^{b} 4 2/10"

burst, 4606 round.

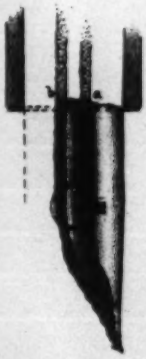
(See Plate IX and XI.)

D. Van Nostrand Pub.

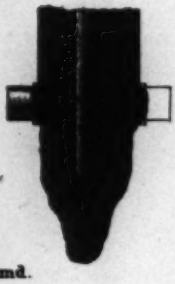
T. Bien N.Y. Lith.



Section through trunnions.



Fragment-plane of trunnions.
a.b. Crack running back toward breech.



100th GUN.
No. 104.
759.

Burst at 216th round.

Plane of vent.

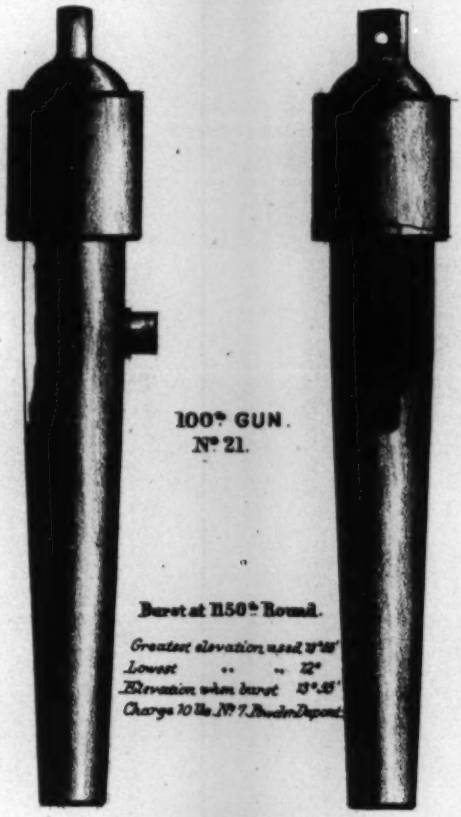
For weight & dimensions see par. 186.

D. Van Nostrand Pub.

J. Bien, N.Y. Lith.

Upper Side.
Plane of vent.

Right Side.
Plane of Trunnions.



100th GUN.
No. 21.

Burst at 1150th Round.

Greatest elevation used 13°15'
Lowest " " 12°
Elevation when burst 13°35'
Charge 10 lbs No. 7 Powder Dupont.

For weight & dimensions see par. 186.

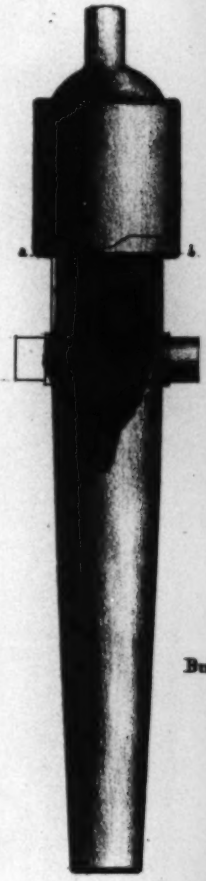
D. Van Nostrand, Pub.

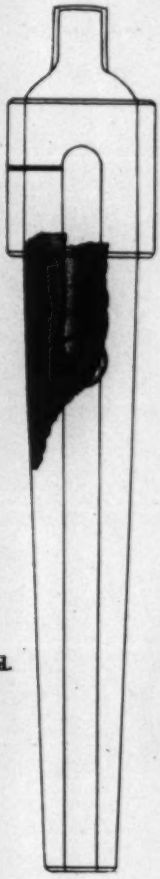
J. Bien N.Y. Lith.

Section on a.b.

Upper Side, Plane of vent.

Left Side, Fragment.





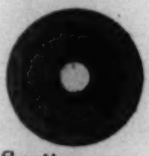
100ᵖ GUN.
Nº 158.
66.

Burst at 258 Round.

For weights & dimensions see pan 186.

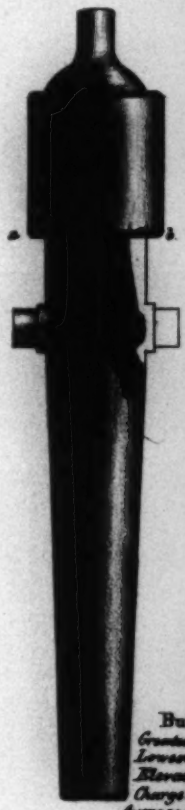
D. Van Nostrand Pub.

J. Bien. N.Y. Lith.



Section on a b.

Upper Side, Plane of vent.



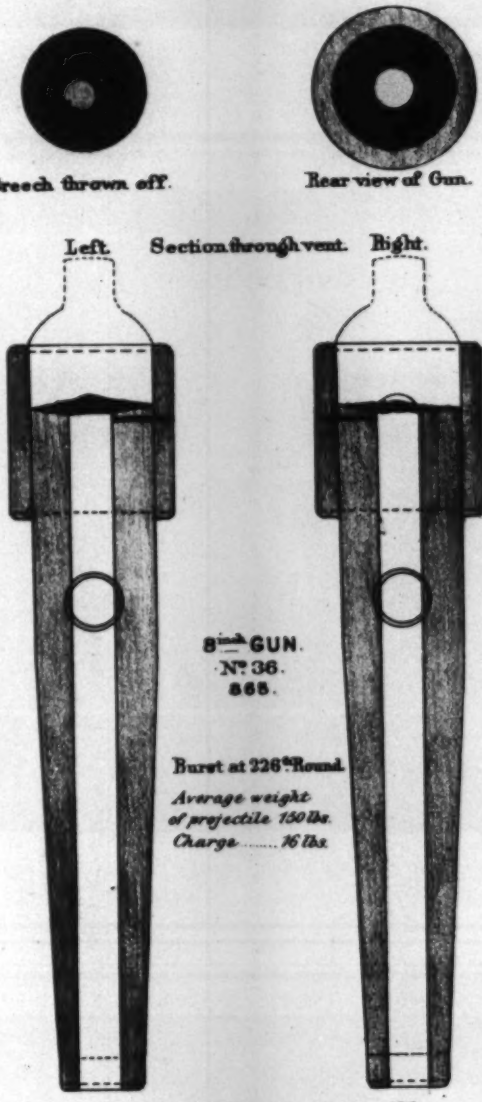
Left Side, Plane of trunnions.

100th GUN.
No. 19.
418.

Burst at 128th Round.
Greatest elevation used 3° 30'
Lowest " " 3° 30'
Elevation when burst 3° 30'
Charge 10 lbs No. 1 Powder Dupont.
Average weight of projectile 80 lbs.
For weight & dimensions see par. 186.

D. Van Nostrand Pub.

J. Bien N.Y. Lith.

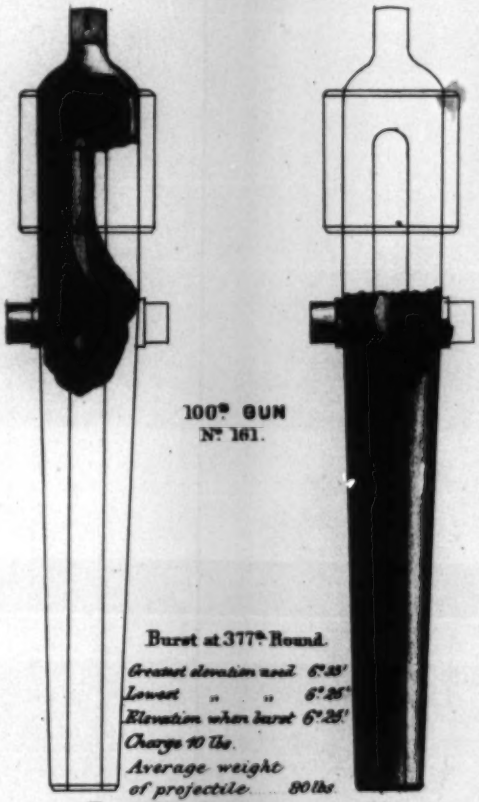


For weight & dimensions see par. 186.

D. Van Nostrand Publ.

J. Bien N.Y. Lith.

Upper Side, Breech Fragments. Lower Side, Muzzle Fragment.



100ᵐ GUN
Nº 161.

Burst at 377ᵗʰ Round.

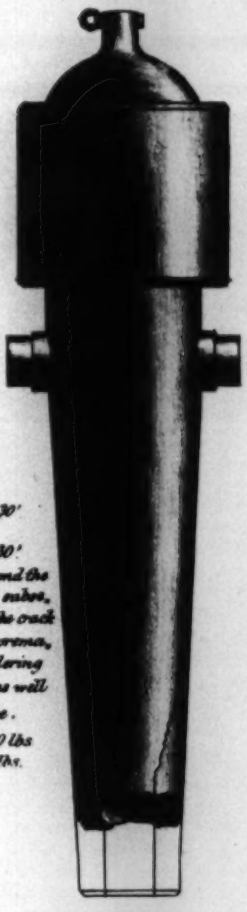
Greatest elevation used 6°.39'
Lowest „ „ 6°.26'
Elevation when burst 6°.25'
Charge 10 lbs.
Average weight of projectile 80 lbs.

For weight & dimensions see par. 786.

10 inch GUN. No 1.

Muzzle.

Fracture.



Lower Side.

Fractured at 27th round.
Shell burst in the muzzle.
Greatest elevation used 13° 30'
Lowest " " 13°
Elevation when burst 13° 30'
This gun was "chipped" back beyond the termination of the fracture and subsequently fired 371 rounds when the crack was still further opened by the premature explosion of the shell, rendering the gun useless. The gun fired as well after the first fracture as before.
Weight of projectile ..... 250 lbs
Charge ..... 26 lbs.

For weight & dimensions see par. 186.

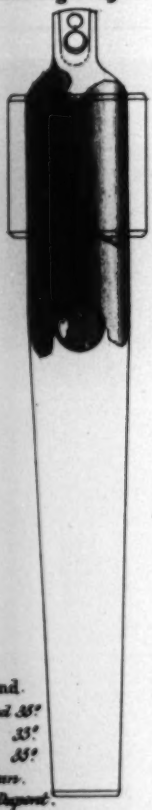
D. Van Nostrand Publ.

J. Bien N.Y. Lith.

Left Side.

Principal Fragments.

Remaining Fragments.

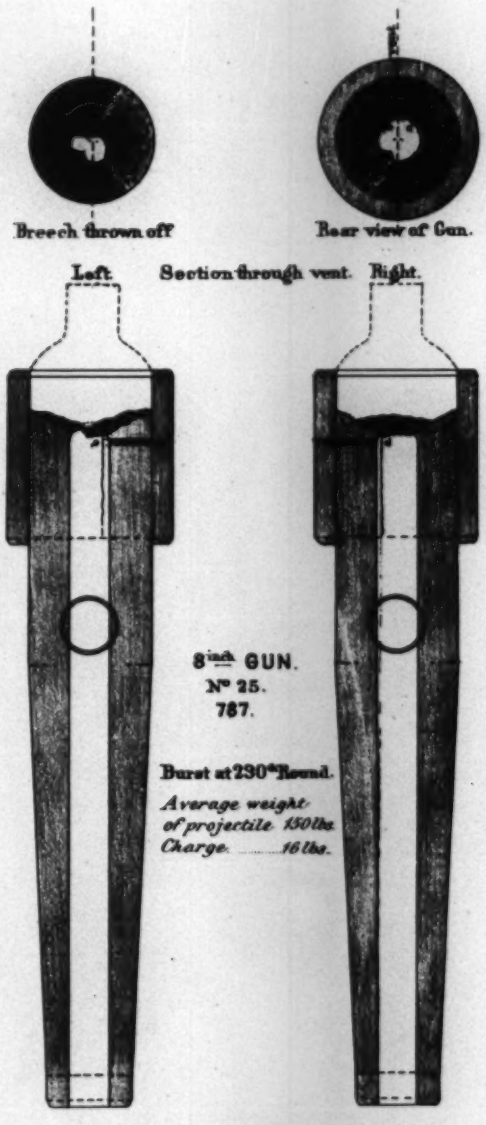


100ᵗʰ GUN.
Nº 53.

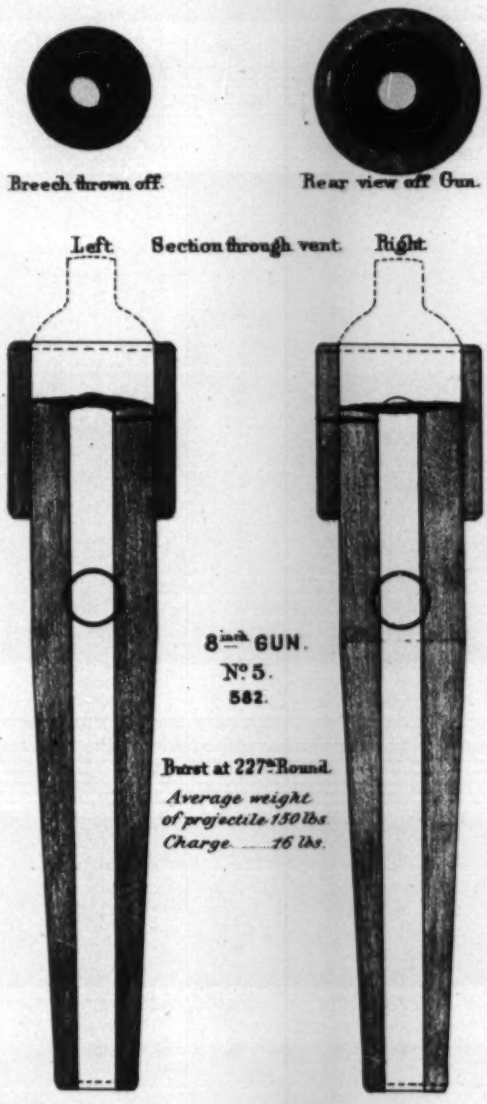
Burst at 152ⁿᵈ Round.
Greatest elevation used 35°
Lowest " " 33°
Elevation when burst 33°
Shell exploded in the gun.
Charge 10 lbs Nº 1 Powder Depot.
Average weight of projectile 80 lbs.
For weight & dimensions see par. 186.

D. Van Nostrand, Publ.

J. Bien, N.Y. lith.



For weight & dimensions see par. 186.

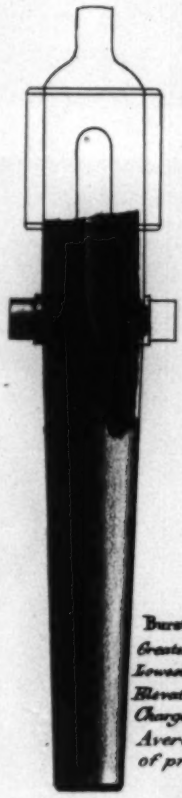


For weight & dimensions see par. 186.

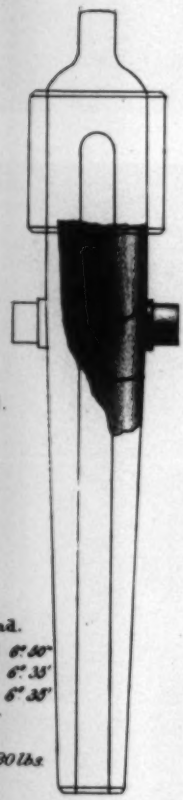
D. Van Nostrand, Pub.r.
J. Bien. N.Y. Lith.

Breech, broken off.

Lower Side, Plane of vent.



Lower Side, Fragments.



100th GUN.
No. 157.
69.

Burst at 219th Round.

Greatest elevation used 6° 50'
Lowest " " 6° 35'
Elevation when burst 6° 35'
Charge 10 lbs.
Average weight of projectile 80 lbs.

For weight & dimensions see par. 186.

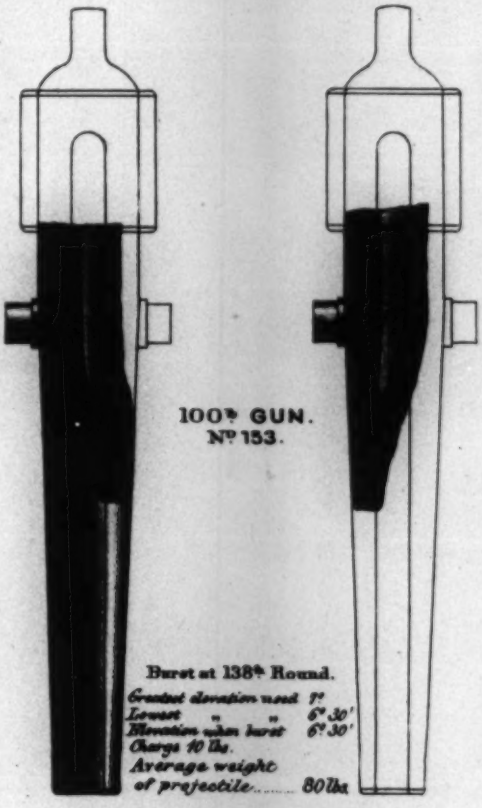
D. Van Nostrand Publ.

J. Bien N.Y. Lith.

Breech broken off.

Under Side, Plane of Vent.

Upper Side, Fragments.



100ᵖ GUN.
Nº 153.

Burst at 138th Round.

Greatest elevation used	7°
Lowest " "	6° 30′
Elevation when burst	6° 30′
Charge 10 lbs.	
Average weight of projectile	80 lbs

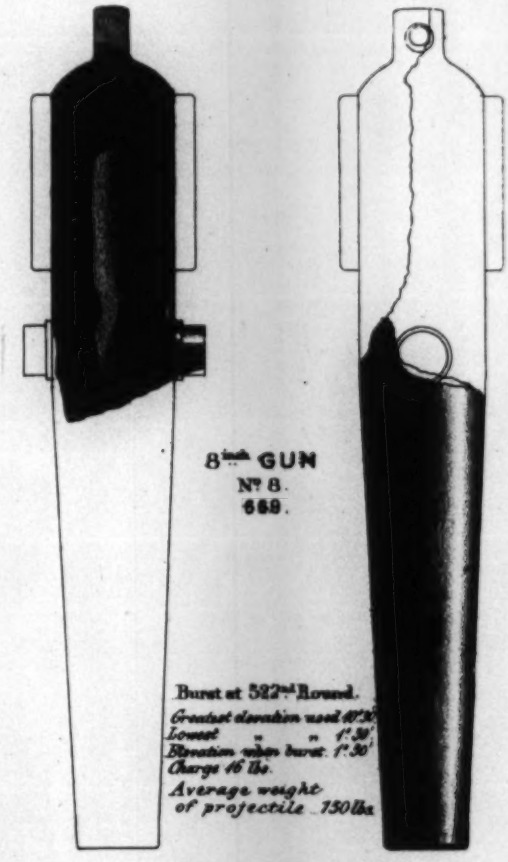
For weight & dimensions see par: 168.

D. Van Nostrand, Pub.

J. Bien, NY. Lith.

Principal Fragment

Lines of Fracture. Left Side.



8 inch GUN
N° 8.
668.

Burst at 522nd Round.
Greatest elevation used 47°20'
Lowest " " 1°30'
Elevation when burst. 1°30'
Charge 16 lbs.
Average weight of projectile 130 lbs

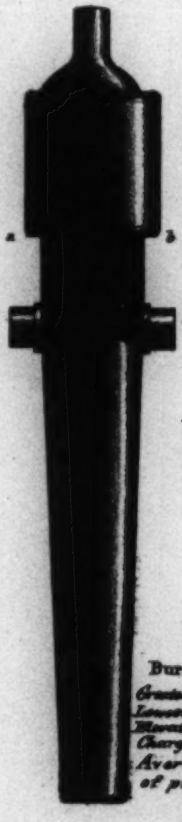
For weight & dimensions see par. 462.

D. Van Nostrand Pub.

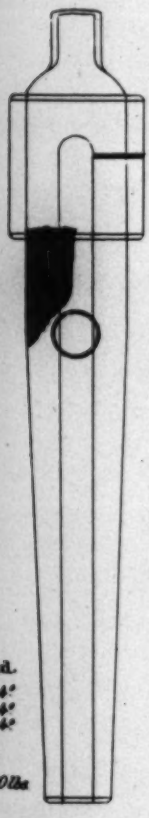
J. Bien N.Y. Lith.

Section on a b.

Lower Side, Plane of Vent.



Right Side, Fragment.



100ᵖ GUN
Nº 66.
568.

Burst at 331st Round.

Greatest elevation used	4°
Lowest " "	4°
Elevation when burst	4°
Charge 10 lbs.	
Average weight of projectile	80 lbs

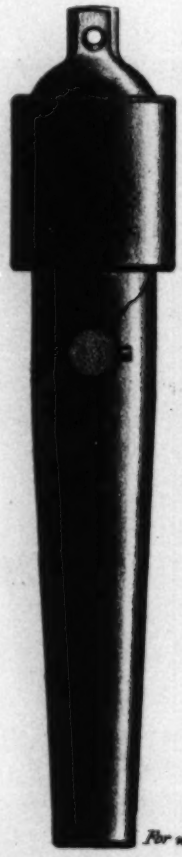
For weight & dimensions see par. 168.

D. Van Nostrand, Pub.

J. Bien, N.Y. lith.

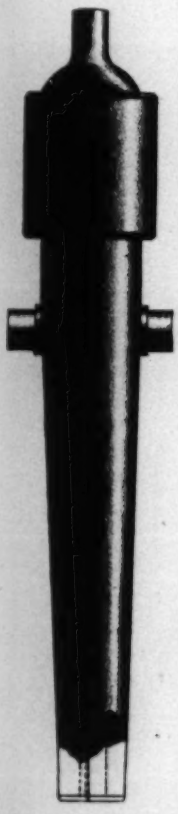
8 inch GUN.
Nº 4.
546.

Right Side.



100 lb GUN.
Nº
95.

Lower Side.



For weight & dimensions see par. 168.

Burst at 599 lb Round.

Greatest elevation used 11°
Lowest " " 10°
Elevation when burst 11°
Charge 16 lbs.
Average weight
of projectile 150 lbs

Burst at 87 lb Round.

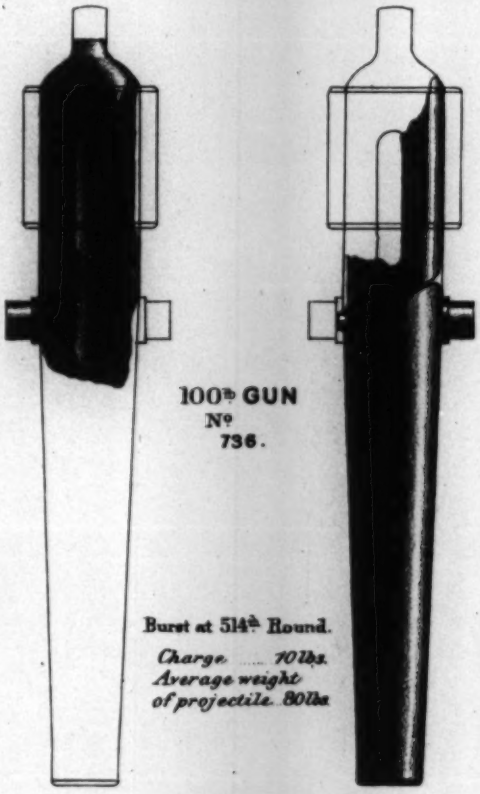
Charge 10 lbs.
Average weight
of projectile 80 lbs
Shell exploded in muzzle.

D. Van Nostrand, Pub.

J. Bien, N.Y. lith.

Principal Fragment.

Upper Side, Plane of Vent.



100ᵖᵈ GUN
Nº
736.

Burst at 514ᵗʰ Round.

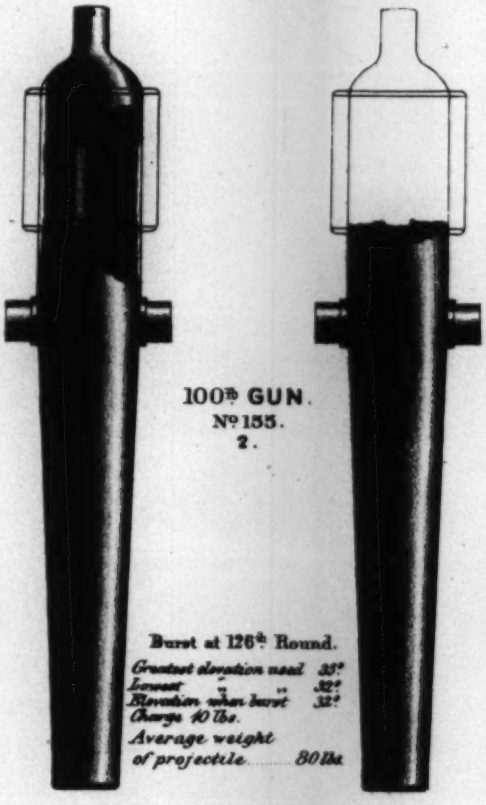
Charge ..... 70 lbs.
Average weight of projectile 80 lbs

For weight & dimensions see par. 168.

D. Van Nostrand Pub.

J. Bien. N.Y. Lith.

Upper Side, Plane of Vent. Lower Side, Plane of Vent.



100th GUN.
No. 155.
2.

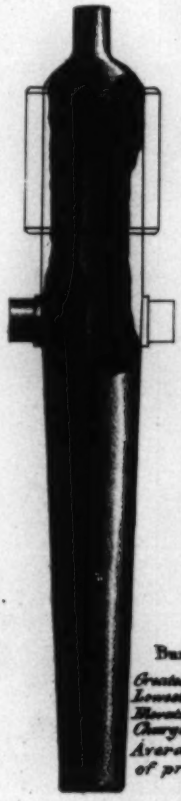
Burst at 126th Round.

Greatest elevation used 35°
Lowest " " " 32°
Elevation when burst 32°
Charge 10 lbs.
Average weight of projectile ..... *80 lbs.*

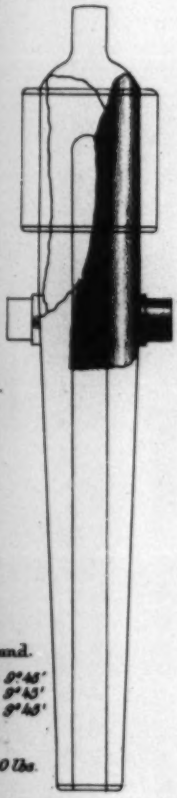
For weight & dimensions see par. 168.

D. Van Nostrand Pub. J. Bien N.Y. Lith.

Upper Side, Plane of Vent.



Upper Side, Fragment.



100ᵇ GUN.
Nº 97.
708.

Burst at 438ᵗʰ Round.

Greatest elevation used	9°45′
Lowest " "	9°45′
Elevation when burst	9°45′
Charge 10 lbs.	
Average weight of projectile	80 lbs.

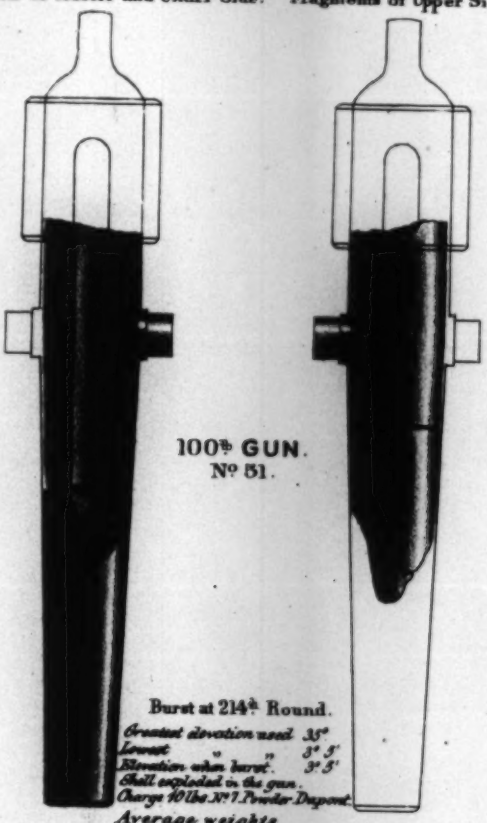
For weight & dimensions see par. 468.

D. Van Nostrand, Pub.

J. Brien, N.Y. Lith.

Breech broken off.

Fragments of Muzzle and Under Side. Fragments of Upper Side.



100th GUN.
No 51.

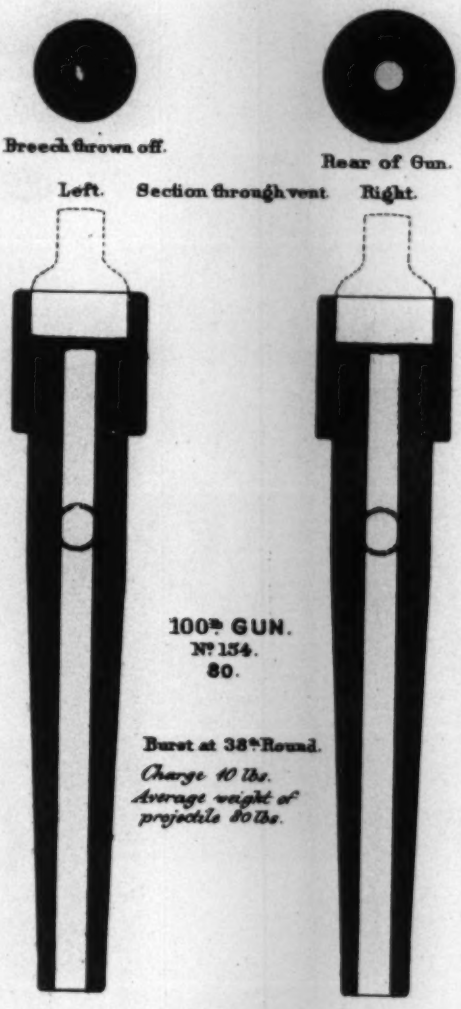
Burst at 214th Round.

Greatest elevation used 35°
Lowest " " 3° 5'
Elevation when burst. 3° 5'
Shell exploded in the gun.
Charge 10 lbs No 7 Powder Dupont.
Average weights of projectile 80 lbs.

For weight & dimensions see par. 168.

D. Van Nostrand Pub.

J. Bien, N.Y. Lith.

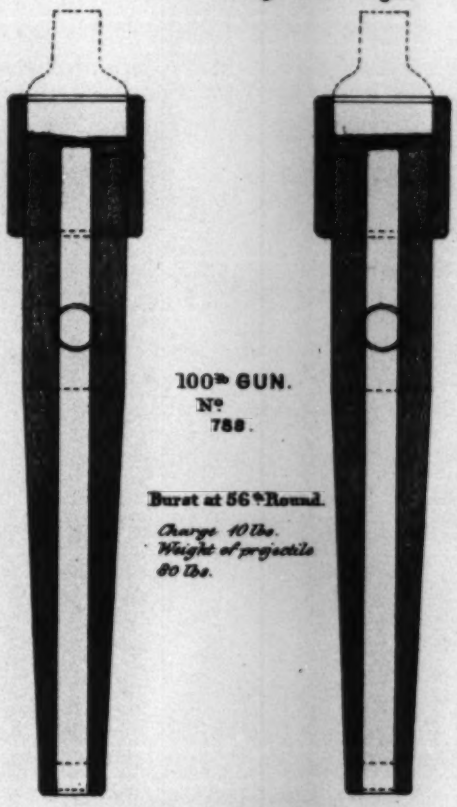


For weight & dimensions see par. 168.

D. Van Nostrand, Pub.
J. Bien, N.Y. Lith.

Rear view of Gun.

Left. Section through vent. Right.



100^{lb} GUN.
N^{o}
788.

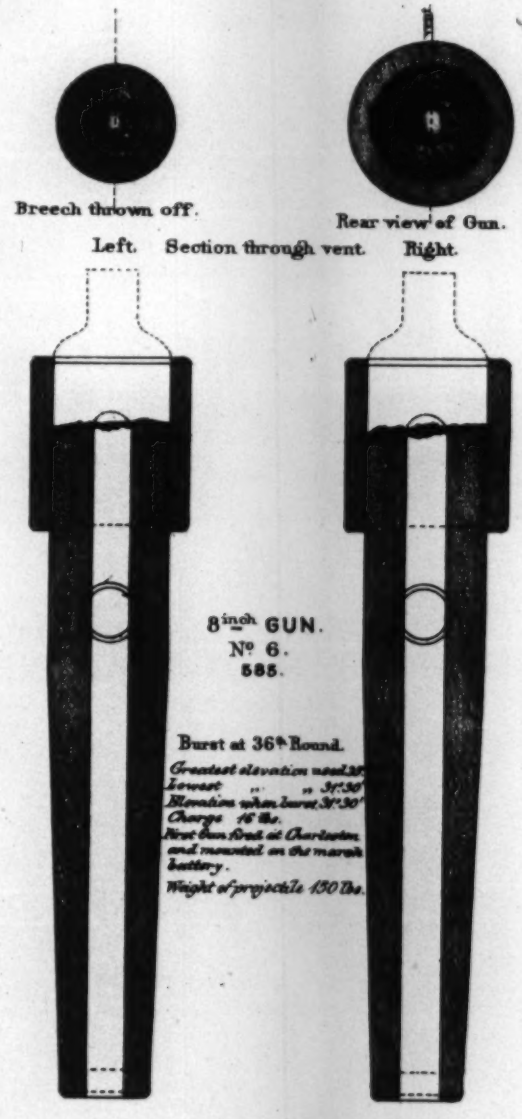
Burst at 56th Round.

Charge 10 lbs.
Weight of projectile
60 lbs.

For weight & dimensions see par. 168.

D. Van Nostrand, Pub.

J. Bien, N.Y. Lith.



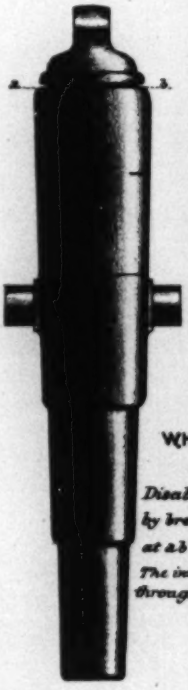
For weight & dimensions see par. 168

Muzzle.

Breech.

Upper Side.

Left Side.



80 Pdr.
WHITWORTH GUN.
Cal. 5 in.

Disabled at 111th round.
by breech starting back
at a.b. & closing vent.
The inner cylinder slipped
through the outer jacket.

N.B. There were two of these guns used against Fort Sumter at the bombardment commencing Aug. 17th. Both were disabled in the manner above indicated.

SHELL.

Scale $\frac{1}{4}$.

After firing.

Section at a b.

Copper packing.

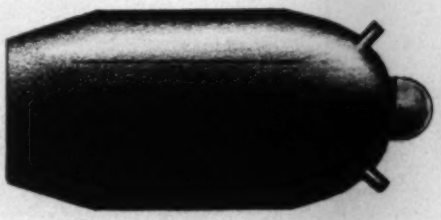
CONFEDERATE SERVICE.

SHOT & SHELL.

SHELL.

Scale $\frac{1}{4}$.

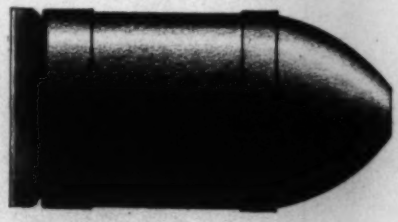
Fuse end of Shell.



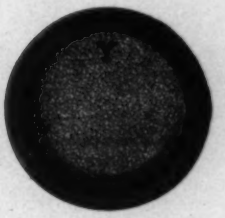
SHELL.

Scale $\frac{1}{4}$.

Before firing.



Base of Shell & wrought iron packing.

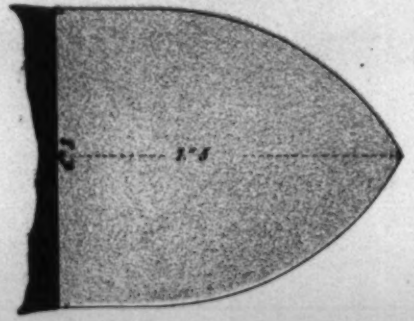


D. Van Nostrand, Pub.

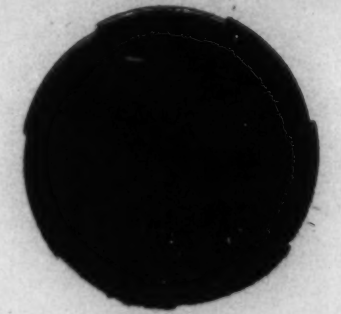
J. Bien, N.Y. Lith.

After firing

Section through axis.



Copper packing.



SOLID SHOT.

Scale $\frac{1}{4}$.

PL. XXXVII.

CONFEDERATE SERVICE
SHOT & SHELL.

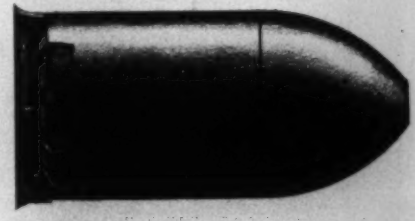
8 in. Shot with section of packing. *Scale 1/8.*
Copper packing.

After Firing.

The Copper packing of the 8 in. Shot and Shell exhibits the same exterior grooving as the wrought iron of the 7 in. Shot below. The 6.40 in. Shot is the same.

8 inch Shell.

8 inch Shell
Copper packing.

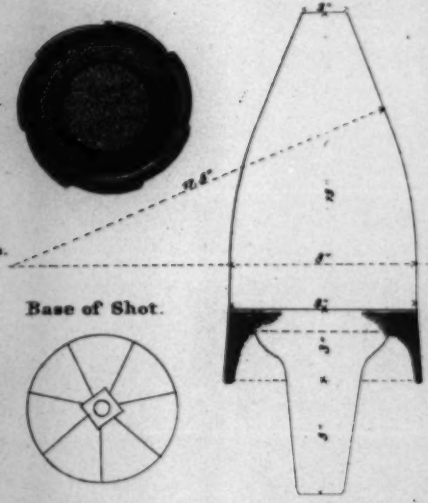


7 inch Shot.

This appears to be a wrought iron case filled with cast iron.
The dotted line is the Profile of the cavity in the base.

Base of Shot.

Profile on axis.

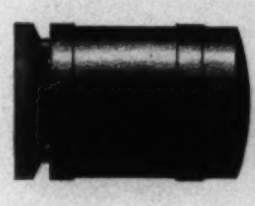


6.4 inch Shot.
Copper packing.

Base of Shot.

D. Van Nostrand, Pub. J. Bien, N.Y. Lith.

Solid Shot Cal. 6.40 in. (before firing)



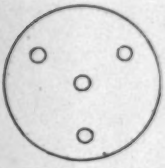
Base of packing.

Section.

Copper packing.

Shot Cal. 6.40 in. (after firing.)

Base of Shot.



Shell Cal. 6.40 in. with section of packing.
Copper packing.

CONFEDERATE SERVICE.

SHOT & SHELL.

Scale ½.

J. Bien N.Y. Lith.

Fig. 3.

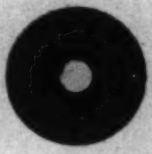


Fig. 2.

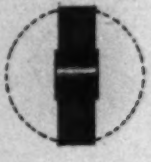


Fig. 1.

Scale of Feet.

AMES'
WROUGHT IRON RIFLE.

Cal. 7. inches.

(The trunnions are attached by being
Welded into the side of piece. They
Diam. 3 inches.)

D. Van Nostrand, Pub.

J. Bien, NY. Lith.

APPENDIX A.

REPORT OF BRIG. GEN. J. W. TURNER,

CHIEF OF STAFF AND OF ARTILLERY.

HEADQUARTERS DEPARTMENT OF THE SOUTH,
OFFICE CHIEF OF ARTILLERY,
MORRIS ISLAND, S. C., September 8th, 1863.

GENERAL,—I have the honor to transmit the following general report of the artillery operations on Morris Island, from the 26th day of July, 1863, when, in obedience to your orders, I assumed the direction of them, to the 7th day of September, when our flag was successfully planted on the enemy's works at Fort Wagner and Battery Gregg.

After the failure of the assault upon Fort Wagner on the 18th of July, it was determined by the commanding general to proceed to the erection of breaching batteries against Fort Sumter upon ground then within our possession, and as the work required upon them would nearly, if not quite, consume the entire labor of the command, the approaches to Wagner were not to be pushed till the completion of the batteries should render the labor of the troops available for this purpose.

The selection of the ground for the location of the batteries being determined upon, work was commenced upon them on the night of the 23d of July, and from this date steadily progressed, day and night, with the labor of mounting guns, supplying magazines with implements and ammunition, till all were completed.

The batteries, commencing on the right, ran around to the left, as follows:

BATTERY BROWN—On right of second parallel, near the beach.

Distance from Fort Sumter, 3,516 yards; from Battery Gregg, 2,170 yards; from Fort Wagner, 885 yards.

Armament—Two 8-inch Parrott rifles.

Garrison—Company I, Third Rhode Island Heavy Artillery. Commanded by Captain Charles G. Strahan, Third Rhode Island Heavy Artillery.

BATTERY ROSECRANS—Near left of second parallel.

Distance from Fort Sumter, 3,447 yards; from Battery Gregg, 2,110 yards; from Fort Wagner, 830 yards.

Armament—Three 100-pounder Parrott rifles.

Garrison—Company M, Third Rhode Island Heavy Artillery, and a detachment of the One Hundred and Seventy-eighth New York Volunteer Infantry. Commanded by Captain J. J. Comstock, Jr., Third Rhode Island Heavy Artillery.

BATTERY MEADE—Near left of second parallel, in front of Battery Rosecrans.

Distance from Fort Sumter, 3,428 yards; from Battery Gregg, 2,085 yards; from Fort Wagner, 820 yards.

Armament—Two 100-pounder Parrott rifles.

Garrison—Detachments from Third Rhode Island Heavy Artillery, One Hundredth New York Volunteers and One Hundred and Seventy-eighth New York Volunteer Infantry. Commanded by First Lieutenant Henry Holbrook, Third Rhode Island Heavy Artillery; and, after his death, by First Lieutenant A. E. Green, Third Rhode Island Heavy Artillery.

NAVAL BATTERY—Centre of first parallel, 200 yards north of Beacon House.

Distance from Fort Sumter, 3,980 yards; from Battery Gregg, 2,590 yards; from Fort Wagner, 1,335 yards.

Armament—Two 8-inch Parrott rifles, and two 80-pounder Whitworths.

Garrison—Detachments of sailors from the United States frigate Wabash. Commanded by Commander Foxhall A. Parker, United States Navy.

BATTERY HAYS—On creek, 312 yards west of Beacon House.

Distance from Fort Sumter, 4,172 yards; from Battery Gregg, 2,850 yards; from Fort Wagner, 1,710 yards.

Armament—One 8-inch Parrott rifle.

Garrison—Detachments of Company D, Third Rhode Island Heavy Artillery. Commanded by Captain R. G. Shaw, Third Rhode Island Heavy Artillery.

BATTERY RENO—On creek, 135 yards west of Battery Hays, in sand ridge.

Distance from Fort Sumter, 4,272 yards; from Battery Gregg, 2,950 yards; from Fort Wagner, 1,850 yards.

Armament—One 8-inch Parrott rifle, two 100-pounder Parrott rifles.

Garrison—Company H, Third Rhode Island Heavy Artillery, and a detachment of the One Hundred and Seventy-eighth New York Volunteer Infantry. Commanded by Captain A. W. Colwell, Third Rhode Island Heavy Artillery.

BATTERY STEVENS—Immediately to the left of Battery Reno.

Distance from Fort Sumter, 4,278 yards; from Battery Gregg, 2,950 yards; from Fort Wagner, 1,875 yards.

Armament—Two 100-pounder Parrott rifles.

Garrison—Detachments of Company C, First United States Artillery, and Seventh Connecticut Volunteer Infantry. Commanded by First Lieutenant James E. Wilson, Fifth United States Artillery.

BATTERY STRONG—Immediately to the left of Battery Stevens.

Distance from Fort Sumter, 4,290 yards; from Battery Gregg, 2,950 yards; from Fort Wagner, 1,900 yards.

Armament—One 10-inch Parrott rifle.

Garrison—Detachment of Seventh Connecticut Volunteer Infantry. Commanded by Captain S. H. Gray, Seventh Connecticut Volunteer Infantry.

BATTERY KIRBY—One hundred yards to the left of Battery Strong.

Distance from Fort Sumter, 4,400 yards; from Battery Gregg, 3,000 yards; from Fort Wagner, 1,960 yards.

Armament—Two 10-inch sea-coast mortars.

Garrison—Detachment of Eleventh Maine Infantry. Commanded by First Lieutenant Charles Sellmer, Eleventh Maine Volunteer Infantry.

Most of this heavy artillery had been brought from Hilton Head, and all of it landed on this island since the 24th of July. The place of landing for our artillery, and indeed of all our supplies, was at the south end of Morris Island, in Lighthouse Inlet, a narrow, confined stream, approached from the sea only through a crooked, narrow channel, and over a bar admitting at high water vessels of only eight to ten feet draft. Nearly one-half the time there was no ingress or egress to the inlet, and much valuable time was lost in waiting for high water on which to float our transports over the bar.

From the place where we landed our artillery on Morris Island, to our batteries, was a distance varying from one and a half to two miles. This entire distance was heavy sand, through which all the guns were dragged into position by troops at night. Seven heavy guns were thus dragged to the immediate front of Fort Wagner, put in position, equipped, magazines filled, and the batteries served for seven days, though within half range of seven heavy pieces of artillery with which that place was garnished, and within four hundred yards of their sharpshoot-

ers, with their whole front covered with marksmen armed with telescopic rifles of extraordinary power.

On the evening of the 16th of August, a sufficent number of batteries being completed and in readiness to warrant the opening of the bombardment, final orders were issued to open fire upon Fort Sumter, at daybreak on the morning of the 17th, from all the batteries which were completed, opening the other batteries as fast as they were finished.

Accordingly, on the morning of the 17th, *Battery Brown* opened with one 8-inch, throwing shell. A gunner's gimlet having been accidentally broken off in the vent of the other piece of this battery, its service was lost for three days, while drilling it out.

Battery Rosecrans—One gun throwing shell, and the other two shot.

Battery Meade—Both pieces throwing shell.

Naval Battery—The Parrotts throwing shell, and the Whitworths shot.

Fire was opened in the first instance from the Whitworths with shell, but the frequent instances of premature explosion which occurred made it necessary to abandon the use of shell entirely.

Battery Hays—One 8-inch, throwing shot.

Battery Kirby—Throwing mortar shell.

On the morning of the 18th, there was added to this fire, from

Battery Reno—One 8-inch throwing shell, one 100-pounder throwing shell, and one 100-pounder throwing shot.

On the 19th,

Battery Stevens—One 100-pounder throwing shell.

On the 20th, all our guns were in operation, adding to the fire of the 19th,

Battery Brown—One 8-inch throwing shot.

Battery Stevens—One 100-pounder throwing shot.

Battery Strong—One 10-inch, throwing both shot and shell.

The following batteries had also been erected, with the view of keeping down the enemy's fire, which was to be expected from Fort Wagner and Battery Gregg when we should open our breaching batteries upon Ft. Sumter: viz.

BATTERY HAYS—On creek, 312 yards west of Beacon House.

Distance from Battery Gregg, 2,950 yards; from Fort Wagner, 1,830 yards.

Armament—Seven 30-pounder Parrott rifles.

Garrison—Detachment of Company D, Third Rhode Island Heavy Artillery. Commanded by Captain R. G. Shaw, Third Rhode Island Heavy Artillery.

BATTERY WEED—In rear of first parallel 125 yards.

Distance from Fort Wagner, 1,460 yards.

Armament—Five 10-inch siege mortars.

Garrison—Detachments of Companies H and D, Seventh Connecticut Volunteer Infantry. Commanded by Captain B. F. Skinner, Seventh Connecticut Volunteer Infantry.

BATTERY REYNOLDS—In first parallel.

Distance from Fort Wagner, 1,335 yards.

Armament—Five 10-inch siege mortars.

Garrison—Company B, Third Rhode Island Heavy Artillery, and a detachment of the One Hundred and Seventy-eighth New York Volunteer Infantry. Commanded by Captain A. E. Green, Third Rhode Island Heavy Artillery.

BATTERY KEARNEY—On extreme left of second parallel, next to creek.

Distance from Fort Wagner, 720 yards; from Battery Gregg, 1,955 yards.

Armament—Three 30-pounder Parrott rifles.

Garrison—Detachments of Companies C and K, Seventh

Connecticut Volunteer Infantry. Commanded by Lieutenant S. S. Atwell, Seventh Connecticut Volunteer Infantry.

Besides the above-mentioned guns, there were in position in the second parallel, at a distance of 885 yards from Wagner, eight field guns for defensive purposes to repel sorties, viz.:

Four 12-pounder howitzers of Light Company B, First United States Artillery, Lieutenant Guy V. Henry, First United States Artillery, commanding, and manned by detachments from Company B, First United States Artillery, and Light Company E, Third United States Artillery.

Two 12-pounder Napoleon guns of Light Company F, Third New York Artillery, Captain James E. Ashcroft, commanding, and two 12-pounder Wiards of Light Company B, Third New York Artillery, Lieutenant Paul Berchmire, commanding.

The fire from the breaching batteries upon Sumter was incessant, and kept up continuously from daylight till dark, until the evening of the 23d. For five days all the guns were directed upon the gorge wall, and had resulted in bringing it down to such an extent that on the evening of the 21st a practicable breach had been accomplished. On the morning of the 22d the fire from Batteries Meade, Rosecrans and Brown was directed upon the southeasterly face or right flank of the work, with the view of dismounting the guns on the barbette of this face, which commanded the entrance to the harbor, as well as to destroy the guns on the northeasterly face, which this fire would take in reverse. The fire upon the gorge had, by the morning of the 23d, succeeded in destroying every gun upon the parapet of it, and, as far as could be observed, had disabled or dismounted all the guns upon the parapet of the two faces looking towards the city, which it had taken in reverse. The parapet and ramparts of the gorge were, for nearly the entire length of the face, completely demolished, and in places everything was swept off down to the

arches, the débris forming an accessible ramp to the top of the ruins.

There being nothing further to gain by a longer fire upon this face, all the guns were directed this day upon the south-easterly flank, and continued an incessant fire throughout the day. The demolition of the fort at the close of this day's firing was complete, so far as its offensive powers were considered. Every gun upon the parapet was either dismounted or seriously damaged; the terre-pleine for the entire circuit of the place must have been shattered and ploughed up by our projectiles, hundreds of which had been seen to strike upon it. The parapet could be seen in many places, both on the sea and channel faces, completely torn away down to the terre-pleine. The place, in fine, was a ruin, and effectually disabled for any immediate defence of the harbor of Charleston.

Having accomplished the end proposed, orders were accordingly issued, on the evening of the 23d, for the firing to cease, having been continuously sustained for seven days. There had been thrown five thousand and nine projectiles, of which about one-half had struck the fort.

The labor required for the service of these heavy guns for such a long period of continuous firing was very great; and at its termination both officers and men were nearly exhausted.

The zeal they displayed, and the manner in which they performed their duties throughout, entitles them to much credit. The battery commanders are deserving of especial mention, for the interest and attention which they gave to their duties, and for their efforts to attain that accuracy of fire so essential to success, and which, with the service of rifled guns in the field, is attained only by unremitted attention.

Lieutenant Henry Holbrook, Third Rhode Island Artillery, commanding Battery Meade, was mortally wounded in his battery on the 19th by a fragment of a shell. He

had been the first selected, from the subordinates of his regiment, to command a battery, and had proved himself an energetic, zealous, and brave soldier.

The loss in the batteries during the seven days, was one commissioned officer and twelve enlisted men wounded, and three men killed.

The immense labor of landing all this heavy artillery, putting it in position, equipping the batteries, and supplying them with ammunition and projectiles, was under the supervision of Captain Alfred Mordecai, Ordnance Department, to whose untiring industry, energy and ability, you are indebted for so speedy a completion of your batteries.

Lieutenant James E. Wilson, Fifth United States Artillery, had the immediate charge of mounting guns, and rendered most efficient service in this particular. He was engaged every night for over a month in this laborious duty.

A detachment of Company C, First United States Artillery, have been invaluable in the experience which they possessed in handling ordnance and ordnance stores, and magazine work. Their attention to duty and industry does them great credit.

From the 23d of August till the 30th, a desultory fire was kept up on Sumter to prevent repairs, and hinder the enemy from mounting guns. On the 30th a severe cannonade was opened and continued during the day and the 31st, at the request of the commanding officer of the naval forces, who had in view to enter the harbor on the night of the 31st. This fire destroyed every vestige of a gun or carriage left on the parapet of the work.

During this period our approaches toward Fort Wagner had progressed rapidly, and were, on the evening of the 4th of September, within one hundred and fifty yards of the ditch. A battery of four 8-inch siege mortars and three coehorns, had been established in the fifth parallel at a distance of two hundred and fifty yards from the enemy's

works, and one of two 10-inch siege mortars at a distance of five hundred yards. Captain B. F. Skinner, Seventh Connecticut, commanded the 8-inch mortars, and Captain J. Ben Dennis, Seventh Connecticut, the 10-inch.

At this period of our operations the great disadvantage under which we labored from the want of development in our attack, was most severely felt, in limiting as it did our artillery fire, and enabling the enemy in a corresponding degree to keep up his, as well as to keep his front lined with sharpshooters. Unable to establish batteries on the flanks of our approaches, we were left to the only resource of using our guns over the heads of our own troops and working parties at the front. This led to repeated and unfortunate accidents, as when a rifled shot would prematurely explode or capsize, or the brass ring at the base would strip off, it would almost always injure some one among the thickly crowded troops in the trenches, and obliged us to suspend this fire almost entirely. We replaced it as far as our means would allow by a vertical fire, but the enemy, despite it, brought his artillery, with a formidable fire of sharpshooters, to bear with such fury upon the head of our sap, which together with the want of earth for cover, about stopped further progress.

A consultation was here held with the commanding general, and the assistant engineer in charge of operations at the front, in which it was determined to bombard the place again, in conjunction with the naval forces, if this plan should be agreed upon by the commanding officer of the squadron, and if after thirty hours bombardment, should it appear to be justifiable, to follow it by an assault. In conference with the commanding officer of the naval forces, it was agreed upon to put the Ironsides into the attack upon Wagner, which would bring a battery of eight heavy guns into action, the monitors to prevent the succor of the place, during the night after the first day's bombardment, to interrupt communication between Fort

Wagner and Gregg, and to engage Wagner just previous to the assault.

Accordingly at daylight on the morning of the 5th of September, all the troops but a picket guard being withdrawn to the rear of the batteries, our artillery opened fire.

The following pieces of artillery were brought into action:—One 10-inch rifle, four 8-inch rifles, nine 100-pounder rifles, ten 30-pounder rifles, ten 10-inch siege mortars, four 8-inch siege mortars and three coehorn mortars.

The 30-pounder Parrotts were used principally to intercept communication between Wagner and Gregg. The heavy guns with the exception of two 8-inch in Battery Brown were directed upon the bomb-proofs. Battery Brown was used upon the left flank of the enemy's works extending down to the sea, the vertical fire searched the fort from right to left, and the Ironsides took it in flank enfilading the entire front.

This fire continued with no abatement during the day and night, and opened with renewed vigor on the morning of the 6th.

The enemy's fire was completely silenced by it, and he was driven for cover to his bomb-proof. Our engineers, availing themselves of this, renewed their labors, and on the morning of the 6th had crowned the glacis of the work.

The enemy was unable to withstand for an instant the fury of our fire, but kept close in his bomb-proof, and our parties pushed the sap worked undisturbed. On the evening of the 6th it became apparent that under our fire we could run our approaches so far forward as to mask all the enemy's artillery, and so enable an assaulting column to debouch from them and gain the enemy's parapets without being exposed to a single gun. This it was deemed desirable to do, and accordingly the fire was ordered to be continued till the following morning, the 7th, when an assault was arranged to take place at low tide, which would

give us the greatest breadth of beach. The fire of the heavy rifle guns, though, was slackened, it being evident they were doing no great damage to the bombproof, and five of them were turned upon other parts of the work.

During the night of the 6th information was received that the enemy were evacuating the place, which was confirmed by a reconnoissance when our fire ceased, and our troops immediately took possession.

This bombardment lasted about forty-two hours, in which there were thrown by the land batteries 1,663 rifle projectiles, and 1,553 mortar shells.

Notwithstanding the heavy fire of this bombardment, together with all the fire Fort Wagner had been subject to since the commencement of our attack, from land and naval batteries, its defences were not materially injured. That is to say, the parapets, bomb-proofs, and traverses of sand still remained, and would have afforded shelter to infantry behind them, though greatly tossed about and torn up by our projectiles; but under our fire it was impossible to serve their artillery. Nor could they expose themselves outside of their bomb-proofs for an instant.

Our fire of rifle shells on the 5th and 6th instant, at the bomb-proof, did little or no damage; still it was very effective in other respects, seriously interrupting the communications which ran under the traverses of the sea-face, by filling them with sand. It was also found that a magazine located in one of these traverses was seriously in danger of being penetrated by our rifle projectiles.

The great range which had been attained by the Parrott guns gave the means (with the control which we had of the swamp on the left of our position, in which to establish a gun) of throwing projectiles into Charleston. The difficulty was in preparing a battery in the centre of this swamp, a mile distant from firm ground, as it was required to be, to attain an effective range of Charleston. It was finally overcome by the commanding general, and a bat

tery for an 8-inch Parrott established, under the direction of Colonel E. W. Serrell, Volunteer Engineers, at 7,900 yards from St. Michael's church, in the city of Charleston.

The piece was mounted under the supervision of Lieutenant Wadlie, Seventh New Hampshire, who deserves great credit for the accomplishment of this work, done under so many difficulties.

The battery was garrisoned by a detachment of the Eleventh Maine Volunteer Infantry, commanded by Lieutenant Charles Sellmer, Eleventh Maine.

This battery was opened on the night of the 22d of August on Charleston, and fired some fifteen rounds. Unfortunately, on the second occasion of firing; the gun burst, the breech breaking just in rear of the vent, and was blown clear of the reinforce. Some thirty-five shells were fired in all from it. Both incendiary shells and shells filled with Greek fire were used. The latter worked very poorly, nearly every one prematurely exploding; and it is not determined whether any shells containing Greek fire ever reached Charleston.

The total number of projectiles thrown against Sumter up to the 7th of September, was 6,451; and against Wagner since the 26th of July, 9,875; making a total of artillery projectiles of 16,326.

In closing this report, I would call the attention of the commanding general to the zeal and efficient services rendered by Captain C. R. Brayton, Third Rhode Island Heavy Artillery, who has acted during this period of operations as my assistant.

I am, very respectfully, your obedient servant,

J. W. TURNER,
Chief of Staff and of Artillery.

To Brigadier-General Q. A. GILLMORE,
Commanding Department of the South.

SUPPLEMENTARY REPORT.

OFFICE CHIEF OF ARTILLERY,
FOLLY ISLAND, S. C., November 30th, 1863.

GENERAL,—In compliance with your verbal request that I would give some of the details of firing, with what observations I may have made in the artillery practice, particularly in the use of the Parrott rifle, during the artillery operations upon Morris Island, I would submit the following.

The armament of the breaching batteries first erected against Fort Sumter, as I have before enumerated in my first report, consisted of one 10-inch, six 8-inch, nine 100-pounder Parrott rifles, and two 80-pounder Whitworths.

In the second bombardment, commencing the 26th of October, there were in position one 10-inch, two 8-inch, and nine 100-pounder rifles, one 10-inch columbiad, and four 10-inch sea-coast mortars. And subsequently, at the date of this report, there were added eight 10-inch sea-coast mortars, two 10-inch siege mortars, and two 13-inch sea-coast mortars.

The garrisons of these batteries were made sufficiently strong, so that each gun had three reliefs. A relief consisted of a full detachment of cannoniers, with two and three men for service in magazine with each relief.

A tour of duty for a relief with the breaching batteries was four hours on and eight off; the relief, however, which came on at eight o'clock in the evening generally remained till four next morning, when no night firing took place.

The firing from the batteries against Wagner not being

so rapid or so constant as from the other batteries, men served in them twelve hours on and twenty-four off.

It was quite a task for the men simply to go to and from the batteries, when added to the labor they performed at their guns. The numerous guns of the enemy which encircled us, swept the ground for a space of nearly a mile in rear of our batteries, throwing our camps necessarily beyond it. This distance had to be passed over at every tour of duty.

It very soon became manifest after our fire upon Sumter had opened, that unremitted attention to the service of these rifled guns in every particular of detail, would be imperative to insure that accuracy necessary for success. The precision of fire of the Parrott rifles was remarkable, probably excelling any artillery ever before brought on to the field in siege operations; but it was quickly found that in the field, where preparations are not always very complete, and necessary appliances scanty, that many elements entered to disturb this accuracy, more particularly when the power of the gun came to be taxed, as in the range we wished to attain in our fire upon Sumter; that errors at this distance multiplied in these guns very rapidly, and therefore greater attention than that ordinarily given to a smooth-bore gun would be required to eliminate them. To this end battery commanders were required to be present at all firing, and were constantly instructed and strictly enjoined in the observance of everything connected with the service of the piece which it was thought might in any way affect its accuracy.

It was expected that the 100-pounder and 8-inch rifles would fire with a rapidity of about one discharge in eight minutes, but the result of the first day's firing showed that this time was greatly exceeded. Afterwards, however, when officers and men had more experience, and the machinery of the carriages had worked smooth, the firing was more rapid, and when necessary the 100-pounders could

be fired once in five minutes, and the 8-inch once in seven and eight minutes. The 10-inch was never fired faster than once in ten minutes, but could be served with facility for a day at the rate of once in eight minutes.

There is an immense labor incurred in the handling of the projectiles of these guns, carrying them to and from the magazine while serving the piece, when continuous firing is required. To lighten this task I have had in our later firing, fatigue parties regularly detailed for this work.

It was the practice, in obedience to instructions, to wash the guns out thoroughly after about the twentieth round. I do not know that this was absolutely necessary, but it insures a better service of the gun when dirt and sand are so liable, as in field works, to get in the bore of the piece, and it was found a useful measure of precaution. Time was thus taken to allow the gun to cool, as it became quite hot after about this number of rounds.

The projectiles were also carefully greased, and latterly an oiled sponge has been used in addition after every third or fourth shot. The very great liability, however, of having dirt and sand adhere to the projectile and sponge when thus greased, notwithstanding every care may be taken, makes these expedients very doubtful. If permitted to be used close attention must be given it at all times.

As with the smaller Parrott rifles, when the projectile failed to take the groove, it received a wabbling motion, and frequently capsized. The remedy of slightly separating the band of brass from the base of the projectile to allow the gas to penetrate was quite effectual in stopping it. This required one and two men more in each battery to attend to this duty alone. Great care must be taken to avoid the danger of separating the brass to such extent as to wedge the shell in the gun, which is liable to occur. But few instances occurred of the brass stripping from the projectile.

The frequent premature explosion of shells while in the

piece or just after leaving it, attracted attention, and led to the belief at first that the powder was ignited by the flame passing around the thread of the fuse; every precaution was immediately taken by the use of white lead applied to the thread when inserting the fuse plug, but without correcting the evil.

A close examination through a long period of firing, with many examples, has finally led to the opinion that it is due to defects in the iron at the base of the shell when it comes from the foundry.*

Flaws and cracks which are frequently detected by the eye permit the flame of the burning powder in the gun to penetrate and ignite the charge in the shell. This was a serious evil, producing a rapid destruction of the gun, and caused a suspension of fire entirely whenever it became necessary to throw troops in advance of the batteries. I understand it is now being corrected by a change in the mode of casting the shells.

Two kinds of percussion fuses were used, both of Parrott's invention. In the one, to the plunger is attached two metallic prongs for retaining it in a fixed position for transportation, and which are designed to be wrenched off by the rifle motion of the projectile in the first moments of flight before the inertia of the plunger is overcome, in the other, the plunger is kept in position by a wooden washer over the nipple, and which is broken by the concussion when the projectile strikes. The metallic prongs in the former were found to be too stiff to be always wrenched off as it is expected they will be, or when broken off they caught the plunger and retarded its motion sufficiently to prevent its striking with a force necessary to explode the cap. It therefore became necessary to take off these prongs before inserting the fuse in the shell. In this shape this kind of fuse was used exclusively. But few of the others were used and they did not give satisfaction.

The explosion of a shell was generally ensured when

* See note on page 157.

striking against a vertical wall, but it was by no means so certain when entering rubbish or broken masonry, which the walls of Sumter soon became, or mounds of earth or sand as the defences of Wagner, unless the projectile struck very fair, point foremost. The slightest cause, it was found, would deflect a rifle projectile when striking upon earth or sand, and when deflected it almost invariably failed to explode. In our firing upon the sand parapets and traverses of Wagner, a rifle projectile would bound off when a spherical one would be arrested in its flight, the rifle shot almost always making one high bound after striking and turning end over end.

The great number of shells which failed to explode in our firing from this cause, plainly indicates the advantages that would be derived, from a fuse so constructed as to ensure an explosion, however the projectile might strike.

A violent gale which prevailed for three days exhibited most satisfactorily the constancy of range of these guns. The 10-inch was just perceptibly affected by it, the 8-inch felt it more but was not seriously disturbed, the 100-pounders varied more than the rest, but the deviation was not so great, but that good work was obtained from them during the whole of it.

There seemed to be causes slightly affecting the range of a gun for the same elevation during different parts of the day, which could not be traced either to the powder or the projectile or the manner of serving the guns. Also, two guns of the same calibre in the same battery would with same elevation vary in range. This difference was more constant.

The 10-inch required a little greater elevation to attain the same range than the 8-inch, but was more accurate. It was mounted on an iron carriage with a centre pintle chassis, and worked with great ease and facility. Steps were cut in the parapet upon which No. 1 and 2 mounted to load; the projectiles were carried on hand-barrows.

Unfortunately, it was disabled soon after opening fire, by a premature explosion of a shell near its muzzle, which blew off about eighteen inches of its length. It was repaired at the suggestion, and under the supervision, of Captain Gray, Seventh Connecticut, the battery commander, who was a skillful mechanic, by chopping off the lands for a distance beyond the fractures, and enlarging the diameter of the bore this distance from an eighth to a quarter of an inch. This left a band of iron, as it were, around the muzzle. The gun was fired three hundred and seventy times after this, without any appreciable difference in the range or accuracy being noticed. Subsequently it was completely disabled by continued premature explosions of shells near the muzzle.

The iron used in the manufacture of this gun is of a superior quality, and I see no reason, if it had not been for this accident, which can be guarded against in future, why it would not have endured for one thousand or fifteen hundred rounds, in which case it appears to be the perfection of a heavy rifle gun. No one could witness its performance during the bombardment of Sumter, and notice the terrible crushing effect of its huge projectiles upon the masonry of that place, the ease with which it was worked, and its remarkable accuracy at a distance of two miles and a half, without being filled with admiration and wonder.

Iron carriages of the ordnance and Parrott pattern were used, and worked well. Friction clamps were used on the Parrott carriages, to lessen the recoil, which was sufficient, without them, to take the carriage off the chassis. The working of the 8-inch gun is much facilitated by the use of roller handspikes to raise the rear part of the carriage from the rail when running the piece "in battery." The want of them imposed much additional labor upon our men in working the guns.

The two 80-pounder Whitworth guns in the Naval Bat

tery, though not under my supervision, came under my observation.

These guns opened fire with shell, but it was found necessary to abandon their use entirely, in consequence of their repeated and constant premature explosions, which greatly endangered our troops in the advance trenches, and of the probable injury it would do the guns. Solid shot was then used exclusively. There appeared to be much difficulty experienced at times in loading these guns, by the projectile wedging when part way down. It could then be rammed home only by heavy blows of a handspike, or by attaching a powerful purchase. They were very unsatisfactory in point of accuracy, shooting very wild, seldom hitting Fort Sumter at a distance of three thousand nine hundred and eighty yards. In comparison with the 8-inch Parrotts in the same battery, they fell far short in accuracy; and subsequently one of them became disabled, by the gun apparently sliding through the reinforce to the rear. A displacement of nearly an inch took place, closing the vent completely. The other being considered unsafe after this, further use of it was discontinued.

I append to this report a statement of the number of Parrott guns which have burst, with a brief description of the peculiarities of fracture exhibited in each case.

This number being so great, naturally excites attention, and has raised grave doubts as to the durability of the gun, and therefore a question as to its practical usefulness, notwithstanding its great powers.

Without entering into this question, for which I am in no manner prepared, I may note those points which have come to my observation in the service of the piece, and which I believe have had no inconsiderable influence in the bursting of these guns.

The proper service of these heavy rifled guns is everything, and to secure it in the field, where firing takes place

over parapets and through embrasures, with sand and dirt constantly flying about, will always be a matter of difficulty. The simple matter of sponging, to prevent the admission of sand and dirt in the bore, rises to much importance.

The serious evil that may arise from the presence of sand in the grooves, when a projectile has taken the rifle in passing out, is well understood.

The material of our field works upon Morris Island was dry, hard, flinty sand, which in a windy day was constantly blowing about, and at times to such an extent did it fill the air, that it was a most severe annoyance to officers and men. On such occasions it was almost impossible to keep the pieces free from it; and at all times the sponge and rammer staves, moist from the hands of the men striking the sides and soles of the embrasures, would carry in no inconsiderable quantity. No doubt this difficulty was an extreme one with us in the position of our batteries, and I am of the opinion that it entered as an element, to some considerable extent, causing the destruction of the guns which have burst lately, though by no means sufficient in itself.

A more serious matter was the premature explosions of shells, of which so many have occurred in our late firing. The shock produced by an explosion of a shell within a gun cannot but tend rapidly to destroy it; indeed, in instances which have come under my personal observation, I am confident it was the direct and immediate cause.

In one instance of the bursting of a 100-pounder, where the breech had been blown from the reinforce, I found the base of the shell in the gun. The shell had prematurely exploded, leaving the base in the gun; it had taken the grooves, and was left perpendicular to the axis of the piece, and some inches to the rear of its first position, showing that the last force acting upon it was from the explosion of the powder in the shell.

PARTICULARS OF SIXTEEN BURST PARROTT RIFLES.

No.	Date. 1863.	Calibre of gun.	Elevation when gun burst.	Greatest elevation at which the gun had ever been fired.	Average elevation at which the piece was fired.	No. of rounds the gun had been fired.	No. of premature explosions of shell.	DESCRIPTION.
1	Aug. 24.	8-inch.	31° 30′	31° 30′	31° 30′	35	10	The fracture took place about one inch in rear of vent, perpendicular to axis of piece, the breech being blown out of the reinforce; no injury to reinforce. The gun was thrown forward on to the parapet.
2	Aug. 25.	8-inch.	2°	10°	7° 6	193	3	Same as above, only the gun was not disturbed from its position on the carriage.
3	Aug. 26.	8-inch.	11° 55′	12°	11° 45′	354	—	Same as above; gun thrown forward on to parapet.
4	Aug. 30.	8-inch.	11°	11°	11°	509	5	A fracture simply, without breaking the gun apart, commencing under reinforce and coming out forward about two inches on right and below the highest point of metal, and extending in a curve forward and down to rimbase of right trunnion.
5	Aug. 30.	100-pdr.	9° 45′	9° 45′	9° 45′	439	39	The breech of the gun and forward to trunnions broke in several fragments. The reinforce divided in two nearly equal pieces, separating longitudinally.
6	Sept. 5.	8-inch.	1° 50′	10° 30′	4° 50′	222	5	Breech blown from reinforce, same as 8-inch guns, on 24th, 25th and 26th.
7	Sept. 27.	8-inch.	12°	12° 10′	12° 05′	230	Several.	Reinforce band blown apart. The breech, above a horizontal plane through the axis, and forward to trunnions, blown off, separating in two or three fragments.
8	Oct. 12.	100-pdr.	12° 30′	13° 55′	13°	1,150	Several.	The top of the gun, from a point just in front of trunnions, including right trunnion back to and under reinforce, making a wedge-shaped fragment, was blown off the apex in front of trunnions, the base under reinforce. The fracture under the reinforce was perpendicular to the axis of the piece, about five inches from front of band, and extending down to a horizontal plane through the axis.
9	Oct. 30.	100-pdr.	6° 30′	7°	6° 40′	183	15	The breech broke off perpendicularly to axis, two inches under the reinforce, the band remaining attached to the breech. Forward of this the top of the gun in a wedge-shape, including right trunnion, with apex of wedge just in front of trunnions, was blown off.
10	Oct. 31.	100-pdr.	4°	4°	4°	331	19	Same as the gun on 12th, except it took off both trunnions.
11	Oct. 28.	100-pdr.	3°	3° 20′	2° 40′	140	10	Reinforce separated in two pieces; the breech in rear of trunnions broke in several fragments.
12	Oct. 31.	100-pdr.	6° 35′	6° 50′	6° 40′	219	11	Same as gun on 28th.
13	Oct. 30.	100-pdr.	3° 15′	3° 20′	3° 18′	121	9	Same as gun on 28th.
14	Oct. 31.	100-pdr.	6° 20′	29° 45′	11° 19′	190	13	Breech blew out of reinforce, same as 8-inch gun on the 24th.
15	Nov. 27.	100-pdr.	4°	34°	15° 06′	27	3	Same as gun on 31st.
16	Nov. 28.	100-pdr.	6° 25′	6° 25′	6° 30′	377	5	The reinforce separated longitudinally, and the breech in rear of trunnions broke in several fragments.

These two causes—the presence of considerable quantities of sand, and the premature explosions of shells—may account for the failure of the 100-pounders in our late firing. The sudden giving away of so many before reaching three hundred rounds, when they had attained one thousand to twelve hundred in our first firing, would appear to indicate that some cause existed in the latter that did not in the former; and these two difficulties undoubtedly have existed to a much greater degree in our firing since the 26th of October than they did before.

I am, very respectfully, your obedient servant,

J. W. TURNER,

Brigadier-General, Chief of Artillery.

To Major-General Q. A. GILLMORE,

Commanding Department of the South.

NOTE.—The table given by General Turner, page 156, does not contain a description of all the Parrott rifles which burst on Morris Island, and of which drawings prepared by Captain Mordecai, of the ordnance department, are appended to General Gillmore's Report.

The column in the table headed "No. of Premature Explosions of Shells," was compiled from the records kept by battery commanders, and contains, in one aggregate, not only the shells which broke or exploded in each gun, but those which exploded prematurely after leaving the piece, and does not, therefore, furnish the means of determining, even approximately, the extent of injury to the gun from this cause. Most of the premature explosions of shells took place in front of the gun. Of eighty such explosions from the Parrott 30-pounder, Plates IX., X., and XI., not one took place in the bore of the gun. I am aware that Mr. Parrott assigns this as the principal cause of the rapid destruction of his rifles, while the premature bursting of the shells is ascribed to the friction of the powder against the inner surface of the shells.—Q. A. G.

APPENDIX B.

MAJOR BROOKS'S REPORT.

HEADQUARTERS DEPARTMENT OF THE SOUTH,
ENGINEER'S OFFICE,
MORRIS ISLAND, S. C., September 27th, 1863.

GENERAL,—In compliance with Paragraph 836, Revised United States Army Regulations, and your verbal instructions, I have the honor to submit the following report concerning those engineer operations against the defences of Charleston harbor, which were executed under my direction, between July 12th and the evacuation of Morris Island by the enemy on September 7th, 1863.

I was appointed an assistant to yourself as chief engineer, by General Order No. 6, dated Headquarters, Department of the South, Morris Island, S. C., July 15th, 1863.

On the 29th of August, Captain C. B. Reese, United States Engineers, was appointed Assistant and Consulting Engineer, Department of the South. From that date I received your instructions concerning the work through him.

The siege works executed on Morris Island, may be conveniently classified under the following heads arranged in chronological order.

I. Erection of siege batteries against Fort Wagner, used in the unsuccessful operations of July 18th.

II. Establishment of defensive lines across Morris Island in order to secure our lodgement.

III. Construction of batteries employed in the demolition of Fort Sumter.

IV. Execution of approaches and batteries against Fort

Wagner, which compelled its evacuation on September 7th.

I had charge of the construction of a part of the batteries embraced in the first and third classes, and entire direction, except for five days as noted below, of the second and fourth operations.

The following summary exhibits the amount and nature of the principal items of engineering work herein described:—

Aggregate length of approaches,	3,440 yards
Musketry parapet,	1,025 "
Sand bag revetting,	2,000 "
Splinter proof shelter,	360 "
Inclined palisading,	520 "
Wire entanglement,	300 "
Road and causeway,	750 "

Number of Emplacements built for guns and mortars.	Against Fort Sumter, on the left,	1
	" " " " right,	7
	Against Ft. Wagner previous to July 18	17
	" " " after "	28
	Defensive purposes,	36
	Total,	89
Number of bomb-proof service magazines,		11
" splinter proof " "		7
	Total	18
Number of defensive booms,		3

This summary includes ten emplacements for ordnance and one bomb-proof service magazine built but never used. It also embraces four emplacements for ordnance, one bomb-proof magazine, and 300 yards of sap, executed under the direction of Lieutenant P. S. Michie, United States Engineers, Assistant Engineer, Department of the South, who relieved me while sick, during the first week of September.

This siege work, extending through a period of fifty-five days, was chiefly done under cover of darkness, and under a fire of artillery and sharpshooters, more or less severe. In its execution 23,500 soldiers' day's work, of six hours each, were expended; this number does not include the labor of preparing engineer material, only a small part of which was done under my direction.

Of this work 8,000 days were employed on the defensive arrangements, 5,600 against Fort Sumter and 9,900 against Fort Wagner.

The "day's work" of the soldier above mentioned is, as measured by the amount of work done, about one-fifth that which is ordinarily accomplished by a citizen laborer in civil constructions in a day of ten hours. The earth in which the men wrought was a fine quartz sand containing a small amount of calcareous and vegetable matter.

Excepting the severe storm which occurred the middle of August, the weather was favorable for work; the midsummer heat being greatly modified by cool sea breezes.

Considerable part of the siege material used was prepared and stored at the Engineer depot at the south end of Morris Island. Sand bags were by far the most expensive item of material employed, having been almost exclusively used for revetting. About 46,000 were expended.

The accompanying journal records, with considerable minuteness, in accordance with your instructions, details of the siege operations. It embraces an account of methods used and progress made, officers and troops employed, dangers and difficulties encountered. It is compiled from the construction reports of superintending engineer officers, my own official communications, and reliable private diaries. In a few instances grammatical errors in documents

herein incorporated, which had been hastily prepared during the active operations, have been corrected. In order conveniently to connect this record with others that may be submitted to you, I have noted several important facts relating to the siege not necessarily belonging to my report.

The following list embraces the most important events described and noted in this journal, from the time of landing on Morris Island to the evacuation of Fort Wagner, with the date of their occurrence.

Our lodgment on the south end of Morris Island was effected on the morning of July 10th: an unsuccessful assault on Fort Wagner was made on the morning of the 11th.

July 12, *night.*—Opened the first parallel, and began the construction of batteries against Fort Wagner, 1,350 yards distant.

July 14, *noon.*—Broke ground for the left batteries.

July 15.—Mounted first piece of ordinance against Fort Wagner.

July 18, *day.*—Bombarded Fort Wagner with forty-two siege and field guns and siege mortars.

July 18, *evening.*—Made an unsuccessful assault on the fort.

July 18, *night.*—Began to transform first parallel into a defensive line.

July 19.—Began sea-coast mortar battery at the Beacon House.

July 21.—Began emplacement on the left for the first gun used against Fort Sumter.

July 23, *evening.*—Completed the defensive arrangements and improvements in the offensive arrangements of the first parallel.

July 23, *midnight.*—Opened second parallel at 870 yards from Fort Wagner, and placed six defensive howitzers in it, and began obstructions in its front.

July 25, *morning.*—Received first fire from the enemy's batteries on James Island.

July 25, *day.*—Mounted in Battery Hays the first heavy gun used against Fort Sumter.

July 26, *night.*—Reported the second parallel as being as strong as Fort Wagner. The first parallel is abandoned as a defensive line. Began the construction of splinter-proof shelters in the second parallel. Began the construction of breaching batteries against Fort Sumter in the second parallel.

July 29, *night.*—Began seaward defensive barricade on right of second parallel.

August 1.—Seven platforms for heavy rifled guns are laid in second parallel.

August 2, *night.*—Ordnance corps mounted the first breaching gun in the second parallel used against Fort Sumter.

August 5, *night.*—Completed obstacle in front of second parallel.

August 8, *day.*—Made experiments relating to sapping.

August 9, *night.*—Opened third parallel, distant 540 yards from Fort Wagner, and approach to it, by flying sap.

August 10, *night.*—Used calcium light against Cummings Point.

August 11, *morning.*—Heavy firing from Fort Wagner. Work was stopped by it for the first time.

August 11, *day.*—Began preparation of siege material on Folly Island.

August 11, *night.*—Finished seaward defensive barricade.

August 12, *day.*—First experimental shot fired at Fort Sumter from Battery Hays.

August 15, *day.*—Began instruction of engineer soldiers in sapping.

August 17, *morning.*—Commenced the first bombardment of Fort Sumter.

August 18.—Trenches are flooded with water in consequence of spring tide and heavy northeasterly storm.

August 19, *morning.*—Started the full sap against Fort Wagner from the left of the third parallel.

August 21, *noon.*—The artillery fire so severe that the progress of the sap was stopped. A few 8-inch Parrott rifle projectiles were fired at Fort Wagner.

August 21, *night.*—Established fourth parallel, distant 350 yards from Fort Wagner.

August 22, *day.*—Reported on difficulties of sapping under the fire of Fort Wagner.

August 23, *evening.*—The first bombardment of Fort Sumter is ended.

August 23, *night.*—Built "redan" on left of fourth parallel.

August 25, *evening.*—Unsuccessful attempt was made to dislodge the enemy from the "ridge."

August 25, *night.*—James Island fire very severe.

August 26, *evening.*—The "ridge" was taken by assault.

August 26, *night.*—Fifth parallel established, at 245 yards from Fort Wagner, and approaches opened to within 100 yards of the ditch of the fort.

August 29, *evening.*—Began second (two days') bombardment of Fort Sumter.

August 29, *night.*—Completed 8-inch siege-mortar battery in fifth parallel.

September 5, *morning.*—Began final bombardment of Fort Wagner.

September 6, *night.*—Crowned the glacis of the work. Fort Wagner was evacuated during the night.

Information relating to several subjects connected with the engineering operations of the siege, which possesses

professional and general interest, yet is not entirely suitable to be incorporated in the journal, is appended thereto.

The following is a list of these papers, arranged and numbered for convenience of reference. Attached to each paper are the drawings necessary for its illustration.

1. Inclined Palisading.
2. Wire Entanglement.
3. Booms.
4. The Seaward Defensive Barricade.
5. Torpedoes, (enemy's.)
6. Observations concerning the Location, Organization, and Administration of an Engineer Depot or Park, from Experience in the Siege Operations.
7. List of the various kinds of Tools, Materials, and Machines furnished from the Engineer Depot, and employed in the Siege Operations against the Defences of Charleston Harbor, 1863.
8. Statement of the Quantities of the most important Items of Engineer Material expended on the Siege Works herein described, according to accounts kept at the Engineer Depot.
9. Preparation or Manufacture of Siege Material.
10. Sandbags.
11. Mortar Platforms.
12. Iron Embrasure Linings.
13. Sapping.
14. Sharpshooters.
15. Penetration of rifled musket-balls into various kinds of Siege Materials, as ascertained by experimental firing on Morris Island.
16. The Billinghurst and Requa Rifle Battery.
17. Broad-wheeled Sling-carts.
18. Working-parties, and Health of the Troops.
19. Colored Troops for Work.

20. The main Magazine, Telegraph Office, Lookout, and Latrine in the Second Parallel.
21. Splinter-proof Shelter.

The following-described drawings, prepared for general reference, will illustrate this report, viz.:

Plate No. IV. Plan of a portion of the siege operations against the defences of Charleston harbor, showing the "left batteries."

1. A part of the batteries erected against Fort Wagner prior to July 18, 1863.
2. A part of the breaching batteries against Fort Sumter, used also against Fort Wagner and Battery Gregg.

All the last-named batteries, except "Hays," were constructed under the direction of Lieutenant Michie, Assistant Engineer.

Plate No. III. Plan of a portion of the siege operations against the defences of Charleston harbor, prior to the evacuation of Fort Wagner, September 7th, 1863, showing,

1. Defensive lines across Morris Island;
2. Approaches and batteries against Fort Wagner;
3. Part of the breaching batteries against Fort Sumter, together with sections showing the more important details.

Much of the credit which attaches to the success of the operations above enumerated belongs to the following-named line officers of the New York Volunteer Engineers. It is just that I should here briefly mention their most valuable services, which are more fully recorded in the journal.

Captain Joseph Walker was highly conspicuous for his display of bravery and energy in advancing the approaches against Fort Wagner. During the nights of the 19th and 26th of August and the 5th and 6th of September, Captain Walker being in charge of the sap, more than one-

half of the whole distance from the third parallel to Fort Wagner was executed by the flying sap.

To Captain J. L. Suess belongs all the credit of building the surf battery and seaward defensive barricade on the right of the second parallel, which formed one of the most important and characteristic features in our defensive lines. Captain Suess established the fourth parallel on the night of August 21st. He was severely wounded in the hand at the head of the sap, September 3d.

Captain F. E. Graef, from sickness and duties elsewhere, was not long engaged on the works herein described. He built the large magazine in the second parallel, and rendered valuable service in the advanced parallels.

Captain S. C. Eaton was but a few days on duty on the work executed under my direction. He was chiefly employed on the extreme left.

Lieutenant H. Farrand had chief superintendence of the earthwork of the second and third parallels, throughout the siege. His services in opening both were conspicuous.

Lieutenant C. L. Wilcken had entire charge of building the splinter and bomb-proof shelters in the second parallel. After completing this work he was engaged on the sap.

Lieutenants Farrand and Wilcken were more days on duty under my orders than any other engineer officers.

Lieutenant E. N. K. Talcott assisted Lieutenant Farrand in the operations above enumerated, and chiefly superintended the construction of Batteries Rosecrans and Meade. He has given valuable aid in preparing this report.

Lieutenant J. S. Baldwin superintended the construction of the left batteries used in the first bombardment of Fort Wagner. His services, since, on the right, have been valuable.

Lieutenant P. McGuire built the first emplacement for a

breaching gun against Fort Sumter. He was on duty a few days in the approaches and superintended the construction of a 10-inch sea-coast mortar battery.

Lieutenant Charles B. Parsons was one of the four officers detailed for and employed on sapping duty.

Captain F. H. Cruso and Lieutenant R. W. Coe, were constantly on duty in the engineer depot.

Lieutenant H. Mehles, and after him, and for a much longer period, Lieutenant J. H. Harold, commanded the detachment on Folly Island, which made nearly all the sap rollers, gabions and fascines used in the siege.

Captain W. Pratt, Fifty-fifth Massachusetts Volunteers, and Lieutenant M. Adams, Fourth New Hampshire Volunteers, were the only infantry officers detailed for engineer duty. They rendered efficient services during the latter part of the siege, while under my orders.

Lieutenant James E. Wilson, United States Artillery, assisted in establishing the defensive lines.

Lieutenant N. M. Edwards, New York Volunteer Engineers, has chiefly superintended the execution of the surveys, maps and plans which accompany this report, besides rendering important services on siege works not under my direction.

In the former duty he has been assisted by artificers Lorrigan, Buckland (now a lieutenant) and Conroy of Company A, New York Volunteer Engineers and Corporal Becker of the One Hundred and Third, and private De Chambord of the Independent Battalion New York Volunteers.

Of the troops employed in the fatigue duties, the New York Volunteer Engineers stand pre-eminently foremost. From the first blow to the last, in every part of the work, at all times of the day and night, in all weathers, and under the most severe fire, the line officers, non-commissioned officers, artificers and privates of this regiment were to be found on duty, executing themselves the more diffi-

cult kinds of work, and directing the infantry details on the other work.

Of the numerous infantry regiments which furnished fatigue details, the Fourth New Hampshire Volunteers did the most and best work. Next follow the blacks, the Fifty-fourth Massachusetts Volunteers, and Third United States colored troops.

Brigadier General Alfred H. Terry commanded the United States forces on Morris Island, from which the guards of the trenches and the working parties were chiefly furnished.

As an assistant engineer I am under many obligations to him as commandant of the infantry employed in the siege operations herein described.

Respectfully your obedient servant,

T. B. BROOKS,

Major A. D. C. and Assist. Engineer.

Major-General Q. A. GILLMORE,

Commanding Department of the South

and Chief Engineer.

MAJOR BROOKS'S JOURNAL

OF

ENGINEER OPERATIONS EXECUTED UNDER HIS DIRECTION ON MORRIS ISLAND, BETWEEN JULY 12TH AND SEPT. 7TH, 1863.

THE batteries employed in the bombardment of Fort Wagner on the 18th of July were in two lines.

The advanced line, 1,350 yards from the fort, formed the right wing, and was commenced on the evening of July 12th, on the site selected by the general commanding. This line was afterward designated the "first parallel"* of the siege. Its centre is 285 yards N. by E. from the "Beacon House." I superintended the opening of this parallel, and was relieved about midnight by Colonel E. W. Serrell, New York Volunteer Engineers, who had the direction of the work. I also had charge of this work the first half of the night of July 13th, and was again relieved by Colonel Serrell.

The second line, or the "left batteries"† was built on a narrow peninsula hummock, which projects westward into the marsh from Morris Island proper. This retired line is 1,830 yards from Fort Wagner, and about 400 yards to the left of the first line.

I received the order to begin the construction of the "left batteries"† about noon, July 14th, 1863.

Tuesday, July 14th.—Began, on site of what appeared to be an unfinished defensive work of the enemy, excavations for the emplacements and magazine for four 10-inch

* See Plate III. † See Plate IV.

siege mortars which will constitute the right wing of Battery O'Rorke.*

Wednesday, July 15th.—Continued work on Battery O'Rorke.

Began and completed positions for four 30-pounder Parrott rifles, being the left guns of Battery Hays,* which is 110 yards in advance of Battery O'Rorke, and 1,830 yards from Fort Wagner.

The Ordnance Corps mounted one 10-inch siege mortar in Battery O'Rorke, being the first piece placed in position against Fort Wagner.

Lieutenant James E. Wilson, United States Artillery, under the direction of Lieutenant C. R. Suter, United States Engineers, Assistant Engineer, Department of the South, had charge of the construction of the left wing of Battery O'Rorke, afterward called Battery Kirby.* Emplacements and a bomb-proof service magazine were prepared for four 10-inch siege mortars. Only one was mounted until after the 18th inst., when two 10-inch seacoast mortars were added; these were used against Fort Sumter in the first bombardment.

Thursday, July 16th.—Completed the right wing of Battery O'Rorke, including a splinter-proof service magazine. The mortar platforms† in this battery consisted of four 3-inch by 10-inch sills covered with ordnance deck plank well spiked down. They failed after six hours firing.† The interior slope of the parapet of the battery was revetted with one thickness of sand bags,‡ four feet high.

Emplacements were also completed for three additional 30-pounder Parrott rifles, making the seven which constitute the left wing of Battery Hays. Five were in embrasure, and two, on the extreme left, in barbette. The latter were arranged to be used against the enemy's boats in the south part of Charleston harbor and Light House Creek, as well as against Fort Wagner.

* See Plate IV. † See Note 11. ‡ See Note 10.

Began, in the right wing of Battery Hays, emplacements for four 20-pounder Parrott rifles. The platforms of these pieces are eight feet square, built of light plank laid on five sills, the centre one running far enough to the rear to support the trail of the piece.

Friday, July 17th.—Completed the work on the right wing of Battery Hays, except emplacements for two additional 30-pounder Parrott rifles, being the right guns of the battery, which were ordered to-day and commenced this night. But for the rain last night the batteries would have opened to-day without these last named guns.

Saturday, July 18th.—The right wing of Battery Hays was completed this morning, all of its guns being in embrasure, arranged to embrace Fort Wagner and Battery Gregg in their field of fire. Five small magazines* were built for the service of the guns of this battery.

All the left batteries were half sunken. Sand bag† revetting was used throughout, even for the embrasures. The fifteen pieces first ordered were ready in sixty hours from the time of breaking ground. About five hundred and forty days' work‡ were expended. The work was mostly done in the night. Considerable care was taken the first two days to mask the batteries. No inconvenience was experienced from the enemy's fire.

Lieutenant J. S. Baldwin, New York Volunteer Engineers, superintended the construction of these batteries.

The following pieces were in position and ready this morning, but owing to the heavy rain, which again fell last night, the batteries could not be opened at daylight, as had been ordered. Constituting the left batteries are Battery Hays, comprising nine 30-pounder and four 20-pounder Parrott rifles; Battery O'Rorke, comprising five 10-inch siege mortars, in all eighteen pieces. On the right, as I learn from the order for firing, are ten siege mortars, and fourteen rifled guns, making the total amount of

* See Plate IV. † See Note 10. ‡ See Note 18.

ordnance in position, right and left, forty-two pieces, embracing twenty-seven rifled siege and field guns, and fifteen siege mortars.

At about 10 o'clock A. M. to-day all these batteries opened fire on Fort Wagner, and with several vessels of the navy, continued the bombardment until dusk, when an unsuccessful assault was made on the work.

During the night of the 18th an obstacle consisting of inclined palisading,* which had been prepared according to directions given by the general commanding, was extended under my direction across Morris Island, from the creek on the left, to high tide on the right, at a distance of 225 yards in advance of the first parallel.† Had the assault been successful this obstacle would have been placed beyond Fort Wagner, if at all. Captain John L. Suess, New York Volunteer Engineers, and Lieutenant Wilson, had charge of this work. Much delay was experienced in the transportation of the obstacle material, on account of the demand for wagons to carry the wounded.

During the night the first parallel was extended to the left or westward about 75 yards by a rifle trench, so arranged as to deliver its fire on the obstacle. This work was not done under my direction.

Sunday, July 19th.—The general commanding has ordered me to have executed the following alterations and additions in the first parallel,‡ with a view to making it a secure defensive line, and to perfect its offensive arrangements, thus to be prepared to resist an advance of the enemy, should his last night's success encourage him to make one, as well as for further operations against him:

1. Extend the obstacle each way; on the right by a return along the beach; on the left by a boom§ across the creek to obstruct the passage of the enemy's small boats.

* See Note 1. † See Plate III. ‡ See Plate III. § See Note 3.

2. Place Requa batteries* in position on the flanks of this parallel, for its defence.

3. Elevate platforms and rebuild revetting and embrasures for six guns on right of the parallel.

4. Transform the centre light gun battery into a siege mortar battery.

5. Extend the siege gun battery, so that it may contain one additional 30-pounder Parrott rifle.

6. Build one bomb-proof magazine for the service of the armament of the first parallel.

7. Build emplacements and a bomb-proof magazine for four 10-inch sea-coast mortars in rear of first parallel, opposite the Beacon House.†

The troops were allowed to rest, bury the dead and care for the wounded during the day, but to-night work was resumed in the first parallel, all the operations above enumerated being commenced. The defensive arrangements received the most attention.

Monday, July 20th.—Continued work in the first parallel, and on the sea-coast mortar battery, day and night. The return in the palisading and the boom were completed. Three emplacements for Requa batteries were finished and occupied, one, on the extreme left of the whole line, firing so as to flank the parallel and defend the entire obstacle, and two, on the right, placed between the parallel and obstacle for economy of room, and so arranged as to enfilade the beach, flank the return in, and fire on the entire palisading. These advanced pieces were protected from the fire of the parallel by a traverse in their rear.

The land batteries and gunboats kept a heavy fire on Fort Wagner to-day.

Tuesday, July 21st.—Continued the uncompleted work of yesterday. An abundance of lumber suitable for magazines, platforms, &c., was found at a landing on the

* See Note 16. † See Plate III.

creek, (the lumber yard) just in advance of the first parallel, having been left there by the enemy.

The general commanding has decided to place one 8-inch Parrott rifle in position on the left, the immediate object, as I understand, being to experiment at long ranges. I was ordered to locate and begin the emplacement for this gun to-day. The position selected was the most northerly point of ground on the left, being about one hundred yards in advance of Battery Hays* and four thousand two hundred yards from Fort Sumter. To reach this battery, as well as others that may be built on the left, more easily than by the road now travelled, I have directed Captain F. E. Graef, New York Volunteer Engineers, to build a new road,† which shall leave the beach about eight hundred yards south of the Beacon House. It was completed to-day, and afterwards used for the heavy transportation.

This morning the enemy made a reconnoissance from a balloon over Fort Johnson.

Wednesday, July 22d.—The work on the sea-coast mortar battery and emplacements for the 8-inch Parrott rifle is in progress. The latter advances slowly, owing to the distance which the earth used in its construction must be wheeled.

But little was accomplished to-day, as the regiment of New York Volunteer Engineers, which is our main dependence in siege work, is being paid.

This night I made, in compliance with official instructions, a second careful reconnoissance of all the ground included within our picket line, which is in advance of the first parallel, and reported the facts observed to the general commanding.

Thursday, July 23d.—To-day the second series of engineering operations in the first parallel, and immediately to its rear, is completed, and my supervision of it, which began on the night of the 18th instant, is ended. About

* See Plate IV. † See Plate II.

one thousand days' work* have been expended on it, and the sea-coast mortar battery, in which no pieces were ever mounted. Three-fourths of this work was done in the night. Neither the enemy's artillery or sharpshooters gave us any serious annoyance at this period. Captain Suess, and Lieutenants H. Farrand and P. McGuire, New York Volunteer Engineers, chiefly superintended the work.

The general commanding has decided to attempt the demolition of Fort Sumter, from positions now held by his forces, the nearest of which is about two miles from the fort. If this plan succeeds, it is understood that the navy will be able to occupy Charleston harbor, thus investing Morris Island, and causing a speedy surrender of its earthworks, which, from their favorable position and thorough construction, have proved so formidable.

As the first step in this plan, I have been ordered to direct the establishment of a strong defensive line across Morris Island at the most advanced practicable point, thus securing our lodgment on the island and depots of supplies, and rendering the construction and operation of the necessary breaching batteries comparatively safe from interruption by sorties. In verbal instructions, my particular attention was called to the importance of a formidable material obstacle in front of the line—one that would go far to "keep the enemy out, even if the work was not defended."

Accordingly, on the night of July 23d, this main defensive line and second parallel† was opened by the flying sap. Its right is situated four hundred and eighty yards in advance of the first parallel, eight hundred and seventy yards from Fort Wagner, and about three thousand five hundred and fifty yards from Fort Sumter.

A bright moon rendered the first part of the night too light to expose a large number of men, the enemy's pickets being within two hundred yards, and vigilant, from the

* See Note 18. † See Plate III.

effect of some skirmishing which occurred in establishing our advanced line of posts. Had Fort Wagner opened fire the work would have been stopped. At about midnight ground was broken, and the following work accomplished by daybreak, when the fatigue parties retired:

1. A parapet ten feet thick and one hundred and seventy-five yards long, following the face of a low ridge, which extended northwest and southeast across the island, was built, under the direction of Captain Suess.

2. On the right of this line, enfilading the beach, and defending all the passable ground in front, six field howitzers,* belonging to Lieutenant G. V. Henry's Battery B, First United States Artillery, and used as guns of position, were placed in a battery having platforms, embrasures, traverses, and a splinter-proof shelter for ammunition.† This work was superintended and rapidly completed by Lieutenant Farrand.

3. An obstacle, consisting of seventy-five yards of inclined palisading,‡ and sixty yards of wire entanglement,§ was built across Morris Island, from low water, on the right, to impassable marsh on the left, at a mean distance of one hundred yards in advance of the parapet. Lieutenant Wilson assisted in the superintendence of this work.

4. A large bomb-proof service magazine‖ was begun in the centre of an old graveyard, (which, it is to be regretted, was too evidently the best place for it,) just in rear of the parapet, under the superintendence of Captain Graef. This structure was intended to be used as a bomb-proof shelter for men, until wanted for powder.

5. The transportation of engineer materials from the depot was conducted by Lieutenant C. L. Wilcken, New York Volunteer Engineers.

The establishment of the second parallel was regarded

* See Plate III. † See Plate III., and Plate III. bis section aa'
‡ See Note 1. § See Note 2. ‖ See Plate III.

at this period as one of the most critical operations of the siege. It was performed to the satisfaction of the general commanding.

The Fourth New Hampshire Volunteers, numbering four hundred and twenty-five effective men, and a detachment of about seventy-five men from the New York Volunteer Engineers, did the work. All the field officers, Colonel Bell, Lieutenant-Colonel Sleeper, and Major Drew, of the first-named regiment, were present. Brigadier-General I. Vogdes was general of the trenches.

I had, on first learning the intention of the general commanding, expressed the belief, and was not alone in it, that the enemy could probably prevent our placing very heavy guns in this advanced position by means of his artillery fire from Fort Wagner. Two weeks later, (night of August 10th,) when he began to use a part of this fire, I saw its effect upon our troops, then well sheltered by parapets, and was confirmed in this belief. The enemy made but little use of Fort Wagner's fire, except for the immediate defence of the work itself.

Friday, July 24.—No work was attempted in the second parallel during the day. It was occupied by our sharpshooters and a strong advanced guard.

To give security and concealment to our line of communication, zigzag approaches from the first to the second parallels were built to-night, under the supervision of Lieutenant McGuire, by means of the flying sap.*

The parapet of the second parallel was strengthened, and extended westward, by Lieutenant Farrand. Sandbags† only were used for revetting.

The inclined palisading was extended by a return along the beach, in a manner similar to the arrangement in front of the first parallel. The wire entanglement was also increased.

Heavy firing from both sides to-day, which was con-

* See Note 13. † See Note 10.

tinued by our mortars in the first parallel throughout the night.

Saturday, July 25.—Completed on the left the first emplacement for a heavy breaching gun, (8-inch Parrott rifle.) This gun was mounted to-day, and first fired at Sumter, August 12th. It was served from a bomb-proof magazine built expressly for it. When afterwards employed against Sumter, it was designated as constituting a part of Battery Hays.* Lieutenant McGuire, assisted by Lieutenant James Baxter, New York Volunteer Engineers, superintended this work.

(This is the last engineering operation with which I have been connected on the left. Henceforward my duties will be on the right, and chiefly in advance of the first parallel.)

To-day was performed the first work by daylight in the second parallel, in continuing its defensive arrangements. Built traverses, formed banquette tread, and continued sand-bag revetting. For the first time, the enemy's sharpshooters have annoyed our working parties.

At night, extended the parapet to the left, and finished the bomb-proof magazine; also built two barbette emplacements for Napoleon guns in the salient angles near the centre of the line, for its defence. Water-casks, procured from the navy, were used as splinter-proof service magazines† for these and other defensive guns.

The defensive arrangements of the second parallel are now so far perfected, that the first parallel has been abandoned as a defensive line, and to-night the remaining inclined palisading in front of it was taken up and set in front of the second parallel, thus extending the return in the obstacle nearly back to the left of the howitzer battery. Captain Graef had charge of the magazine, Lieutenant Wilcken of the obstacle, and Lieutenant Farrand of the other work.

* See Plate IV. † See Plate III.

The enemy opened on our advanced works on the right this morning, with columbiads and a Brooke's rifle, from what was afterwards known as Battery Simpkins,* on Shell Point, distant from the second parallel about three thousand three hundred yards. This is the first fire we have received from James Island, and was particularly heavy to-day. (It afterwards, with the fire of Sumter and Battery Gregg, continued day and night.) Our batteries reply by firing at Wagner, which does not respond. This James Island battery will be most annoying, because our works are not, and could not easily be, defiladed against it, either in profile or trace, on account of the form and scarcity of the ground on which we have to operate.

Sunday, July 26th.—The construction of splinter-proof shelters† for the protection of the guard of the trenches was begun this night in the second parallel, using frames that had been prepared to the rear during the day. A boom,‡ which had been built at the lumber yard by Sergeant Samuel Clark, New York Volunteer Engineers, was floated down with the tide, and made fast across the creek on the extreme left of the second parallel,§ thus securing that flank from being turned by the enemy's boats. An important topographical feature in the second parallel is a small artificial island, situated about seventy-five yards east from the creek, and one hundred and seventy-five yards in advance of the right of the parallel. Upon this island emplacements were built for one Requa battery and three coehorn mortars, to be used against the enemy's sharpshooters. The former also flanked the obstacle. This was afterward designated Battery Kearney. Our line was, to-night, located and worked to the creek, which limits its further extension westward. The left third of this line follows an artificial dyke.

I reported verbally to the general commanding, to-day, that the second parallel is necessarily stronger than Wag-

* See Plate I. † See Plate III. ‡ See Note 3. § See Plate III.

ner, in this, that it admits of as large a musketry fire, has a greater number of, and better, defensive guns, and a formidable material obstacle in front, while the fort has none.

The bomb-proof shelter* in Wagner, its superior natural position, and stronger profile, are advantages over our line.

To-night we ceased to employ the entire fatigue force, now averaging three hundred and seventy-five infantry and one hundred and thirty engineers, on defensive works, and began, on the right of the second parallel, by order of the general commanding, the construction of Battery Brown,* for two 8-inch Parrott rifles, intended to be employed in the demolition of Sumter. Sergeant Walter Smith, New York Volunteer Engineers, had charge of this work.

About two thousand two hundred days' work† have already been expended in advance of the first parallel.

Colonel J. W. Turner, Chief of Staff, Department of the South, was to-day announced as Chief of Artillery also.

Monday, July 27th.—Continued work in second parallel day and night, strengthening parapets of approaches, revetting breast heights,‡ building splinter-proof shelters, and constructing breaching battery. Only a small detachment of engineers work during the day, the heavy work being all done at night. This arrangement is made necessary by the enemy's sharpshooters, who during this period give us more trouble by day than his heavy guns. The least exposure above the crest of the parapet will draw the fire of his telescopic "Whitworths," which cannot be dodged. Several of our men were wounded by these rifles at a distance of thirteen hundred yards from Wagner, where prisoners informed us the riflemen were stationed.

* See Plate III. and Plate III. bis.

† See Note 18. ‡ See Note 10.

Tuesday, July 28.—The parapet and epaulement of Battery Brown are finished. Began laying the platforms to-day; it will be ready for its armament to-morrow morning. This battery is to be served from the large magazine already built. Commenced an emplacement for a Requa battery on the extreme left of the line,* for the defence of the boom; in charge of Corporal P. Berry, New York Volunteer Engineers. Also began a lookout* of sand bags on top of the large magazine, and a splinter-proof latrine,* found to be necessary, on its west side.

About 10 o'clock P. M. I received at the front, through Lieutenant Henry M. Bragg, Aid-de-Camp, an order from the general commanding, "to make my arrangements for five 100-pounder Parrott rifles in the second parallel." At this time some work had been done with a view to putting these guns in position on the left. I had recommended that they be changed to the right, and expected the order. To receive them, a battery for three and one for two guns, afterward named Rosecrans and Meade respectively, were laid out in echelon, near the centre of the second parallel,* and work was commenced on them before midnight. Battery Rosecrans is distant from Fort Sumter three thousand five hundred yards; Battery Meade, three thousand four hundred and seventy-five yards. In order to accommodate the heavy transportation to these batteries, a road was located from them, which struck the beach about one hundred and sixty yards in rear of the second parallel. Its construction was begun this night.

Wednesday, July 29.—The destructive effect of the wind on our works greatly increases the labor of the siege. Strong parapets, built of fine sand, the only available material, are half destroyed in a week, and the trenches are correspondingly filled up; hence a force must be constantly kept on repairs. This same difficulty was experienced at the siege of Fort Pulaski. Any other than the

* See Plate III.

temporary work of a siege should be covered with mud or sods; and I am not sure but it would pay to expend the great amount of labor which would be required in thus covering important siege works.

Guide-boards, containing the names of parallels, batteries, &c., were erected on the right to-day.

Began to-night a bomb-proof magazine, for service of all the 100-pounder Parrott rifles in the second parallel, so located as to form the left epaulements of Battery Rosecrans.

Great difficulty is experienced at the second parallel, which has been the case elsewhere on this coast, in making a permanent obstacle across the beach, to prevent an advance of the enemy at low water. Our wire entanglement in front of the defensive line has been carried away by the spring tides, which caused to float against it timbers which had been used by the enemy for the obstruction of Charleston harbor.

To remedy this, as well as to increase the development of the second parallel, consequently its amount of fire, I proposed to extend the line seaward below high tide, by a defensive barricade* supported on piles. The general commanding gave his approval, and the work was begun this night, under the direction of Captain Suess, who arranged the details of the plan. He completed, at this low tide, emplacements for three Requa batteries. The pieces are in embrasure, protected by a splinter-proof parapet of timber and sandbags. The fire of these batteries enfilades the beach perfectly.

During the latter part of last night, Colonel Edward W. Serrell, New York Volunteer Engineers, Assistant Engineer Department of the South, by order of the general commanding, undertook to extend the obstacle in front of the second parallel seaward by means of abatis, thus to replace the lost wire entanglement. His operations drew a fire of

* See Note 4.

grape and canister from the enemy, which caused the withdrawal of his fatigue party without accomplishing anything, and with the loss of Sergeant Theodore Mandeville, New York Volunteer Engineers. This, so far, is the only engineering operation attempted in advance of the first parallel which has not been under my direction. The abatis provided for this use was deposited at various points along the beach, to the rear of the second parallel, and was afterwards used as a part of the obstacle in front of it.*

Thursday, July 30.—To-day began to put down heavy gun platforms in Batteries Rosecrans and Meade, also continued sandbag revetting in same. This work was in charge of Sergeants Howell and Dutcher, New York Volunteer Engineers. These platforms for the Parrott rifles are more easily laid than any other heavy gun platforms that have been used in this department.

At night, as usual, those portions of the work which require the men to expose themselves above the crest of the parapets, such as epaulements, magazines, splinter-proof shelters, and seaward barricade, were progressed. Built a splinter-proof shelter for the headquarters of the general officer of the trenches, and used also as a telegraph office,* on the east side of the large magazine.

Heavy firing† from both sides during these twenty-four hours.

Friday, July 21.—Continued the work which was in progress yesterday.

The timber required for the piling and cribbing of the seaward work on the right of the second parallel has to be cut on Folly Island, (there being but two trees on Morris Island,) then hauled to Lighthouse Inlet, rafted across, again loaded in wagons and hauled at night, and at low tide, nearly three miles, to the work. I sought some plan to avoid this labor and delay. Having observed that

* See Plate III. † See Note 18.

brush caused the accumulation of sand, which was moved either by wind or water, I thought piers built of filled sandbags, and resting on a foundation of brush, which would prevent their being undermined, would answer to support the banquette tread of the barricade. Experiments tried this day, on the south end of Morris Island, did not warrant the application of this method in practice. Had the bags been of a closer texture, and more firmly bound together with ropes, I think they would have stood. A coating of pitch or tar would have been advantageous.

Saturday, August 1.—To-day was laid the last heavy gun platform in the second parallel, making seven in all; two 8-inch Parrott rifles in Battery Brown and five 100-pounder Parrott rifles in Batteries Rosecrans and Meade. All these batteries can now receive their armament, although the earthwork is not entirely finished.

The engineering operations in the second parallel are out of the way of the ordnance and artillery, but the progress is very slow. One important cause of delay and of increased labor, which affects all the work on the right, is a lack of ground. This want, whether it be expressed by surface or volume, is constantly felt. For want of sufficient space, all the defensive and offensive works of the second parallel are crowded into an area of less than nine acres, having a square development of two hundred and twenty-five yards. Consequently the heavy breaching guns have to fire over defensive ones, and they over each other. There is not room enough, nor earth enough, to make suitable traverses, epaulements, and bomb-proof shelters for the protection of guns, ammunition, and garrison. From lack of depth (the earth does not average over three feet) our trenches have to be sunk so low that they are flooded at spring tides.

A very unpleasant feature connected with this lack of earth arose from the number of dead bodies found in all our advanced work on the right, particularly in the second

parallel, and immediately in front of Wagner. Ten have been exhumed in one night. Handling these bodies was very disagreeable. They were generally in coffins, but many soldiers, friend and foe, were wrapt in the blanket only, and others not that. At first we endeavored to rebury the bodies in places away from the works where they would not be disturbed. But, as the siege progressed, the scarcity of earth compelled a second, and in one case, a third disinterment of the same corpse. After this experience in the second parallel, all bodies that had to be moved were buried in the parapets of the works, where they lie undisturbed.

On an old map Morris Island is called "Coffin Land." It was used, I am informed, as a quarantine burying ground for the port of Charleston.

For the protection of the artillerists, serving the defensive guns in the second parallel, from sharpshooters, the construction of circular rope mantlets, to be attached to the guns, was commenced to-day at the request of Colonel Turner, Chief of Artillery. But little use was made of them, as these guns were seldom used by daylight.

Lieutenant Wilcken, who, up to this time, has superintended the construction of splinter-proof shelters, was for this night relieved by Captain Joseph Walker, New York Volunteer Engineers.

Sunday, August 2nd.—Not having succeeded in fastening the hides which are used in lining the sand bag embrasures of the defensive guns, so, but that the blast of the piece soon destroyed them, I to-day sent a small squad of men to obtain plates of sheet or boiler iron from the wreck of the steamer Ruby, a "blockade runner," to be used for this purpose.*

This night the return in the obstacle in front of the second parallel was extended back to the left of the howitzer battery, thence along its front to the defensive

* See Note 12.

barricade, from which point, with an intermediate link of abatis, the barricade continues the obstacle to low water. Began, by order of the general commanding, a breaching battery, about 130 yards in front of the second parallel, just inside the N. E. salient of the obstacle, also an approach to it from the parallel. Captain Walker superintended the work. This battery was afterward abandoned, and converted into a defensive splinter-proof shelter* for the use of reserves of the grand guard.

To-night Lieutenant Farrand, who has had the superintendence of the musketry and defensive gun arrangements of the second parallel, and of a portion of its heavy batteries, was relieved temporarily by Lieutenant E. N. K. Talcott, New York Volunteer Engineers.

Being convinced, from constant observation, that the enemy's sharpshooters are doing better service and our own becoming less efficient every day, I reported the facts to the general commanding to-day, and suggested a remedy.†

An 8-inch Parrott rifle was mounted in Battery Brown to-night, being the first heavy breaching gun placed in position on the right.

Monday, August 3d.—A 10-inch Parrott rifle has been received by the ordnance department for use in the siege, and the question of its position is under consideration. I to-day submitted to the general commanding the following memoranda setting forth the advantages (as they appeared to me) of a position 225 yards in advance of the first parallel and midway between the beach and the lumber yard, over a position on the left.

1st. The distance to Sumter is 550 yards (about one-seventh) less.

2nd. Greater isolation is obtained from the James Island fire, which has given us most annoyance.

* See Plate III. † See Note 14.

3rd. Much less cost, in labor and time, is required for the transportation of guns and projectiles.

4th. The position on the right gives the best fire on the channel, to be used in case our land batteries had to defend themselves from the enemy's iron clads, in the contingency, which is now considered possible, that the navy be driven to the open sea by a storm.

On the other hand, the left position gives 10° more favorable fire, for breaching the gorge wall and enfilading the sea-face of Sumter, and masks all of its guns which are on the S. E. face. The left position does not require the gun to fire over other batteries which the right does.

I received the order from the general commanding to lay out and begin the construction of an emplacement for this 10-inch Parrott rifle, on the right, in the position above designated. This order was countermanded before the work was commenced, and the gun put in Battery Strong on the left.* Twenty-five hundred nights' work were expended in hauling the gun to its place, nine-tenths of the work being after it had left the beach. In its transportation the wheels of the two sling carts sank into the sand on the beach two inches, and on a dry sand road twelve inches.†

This night began; under the superintendence of Lieutenant Wilcken, the construction of a bomb-proof surgery in the second parallel, using lumber obtained during the day from the Beacon House.

Built a road to proposed Battery Kearney on left of second parallel, being a continuation of the road to Battery Meade. Lieutenant Talcott reports: "My infantry detail for this work were blacks. I found that they did at least one-fourth more than the whites who were with me on the preceding night."‡ Similar reports in favor of the black troops for work were frequently made.

Tuesday, August 4th.—To-day began the construction,

* See Plate IV. † See Note 17. ‡ See Note 19.

at the engineer depot,* of iron plate linings for† embrasures from material obtained from the wreck of the Ruby.

This night commenced work on Battery Kearney,‡ a half sunken siege battery for three 30-pounder Parrott rifles in embrasure. The material for its bomb-proof magazine and platforms was got out at the lumber yard‡ during the day. Captain Walker superintended the work. He reports that "the prisoners employed by him do not work satisfactorily; that he would much prefer to have soldiers." This was a general complaint. Prisoners cannot be depended on for night work under fire. Sometimes more than one-half the detail would escape the guard and go back to camp.§

Lieutenant Farrand reports that all the heavy breaching batteries and their magazines in the second parallel, are completed and are receiving their armament and ammunition.

Next to the want of earth, which could not be remedied, our work on the right is delayed at this period, from lack of men. On the 31st July the general commanding reduced my infantry detail to about one hundred and twenty-five effective men per day. This force, with the engineer troops, is only sufficient for repairs and to keep the work now commenced slowly progressing. Large details, I am informed, are being employed on the "Marsh Battery."

Wednesday, August 5th.—This night we continued the obstruction‖ westward by abatis across an arm of the marsh to Battery Kearney, thence along its front by inclined palisading, and thence by wire entanglement to the booms which cross the creek. This is the last work excepting repairs done on the obstacle in front of the second parallel. The general commanding has given me more instructions concerning it than for all other portions of the

* See Notes 6, 7 and 8. † See Note 12. ‡ See Plate III.
§ Our own men under punishment are referred to here. ‖ See Notes 1 to 4

work together. I have accordingly always personally superintended its construction. The Fourth New Hampshire Volunteers have furnished all the fatigue details employed in setting the palisading and abatis. Sergeant Walters and Corporal Bennett, New York Volunteer Engineers, have put in the wire entanglement. The palisading* was made in panels, at the engineer depot, chiefly from rough bridge material brought from Hilton Head. It, with all engineering material, was transported to the works in the night by means of wagons drawn by four horses.

To-night also began to thoroughly repair and revet with sand bags† the lines of approach between the first and second parallels. This will increase the protection afforded by their parapets, and fit them for conversion into splinter-proof shelters, which are rapidly being extended through them; and it is hoped will, to some extent, lessen the destructive effects of the wind, and the "rat hole" operations of the infantry guard of the trenches, who constantly occupy and destroy them. Boards, instead of sand bags, for revetting these trenches, would cost less for material and labor, but at this period none could be had for this purpose.

Captain Suess reports three Requa batteries in position on the left of the seaward defensive barricade, and thirty-four yards (extending nearly to low water) completed for infantry defence. He proposes that, on the right flank of this work (hence of the second parallel) be built a "surf battery"‡ for two field howitzers. The foundation to be crib work, supporting the gun platforms, and a parapet built of filled sand bags. The general commanding approved the plan; the work was accordingly begun to-day.

The enemy shelled our works very heavily to-day. Our mortar batteries in the first parallel and 30-pounder Parrott rifles on the left replied briskly.

* See Note 1. † See Note 10. ‡ See Note 4.

Thursday, August 6th.—Made repairs in defensive howitzer battery on right of second parallel. Two Wiard field guns now in position there have proven very destructive to platforms and embrasures, more so than any field guns which have come under my observation.

Continued yesterday's work.

Scarcely a gun has been heard to-day.

Friday, August 7th.—I made an official communication to-day, suggesting "that preparatory to extending our approaches beyond the second parallel, the outposts of the guard of the trenches should be advanced gradually, night after night, that as much ground as possible be secured on which the advance can be made by the flying sap, thus saving time." The general commanding ordered this to be done.

Battery Kearney is ready for its armament; the bomb-proof magazine will be finished in one more night. Other work in progress the same as yesterday.

Saturday, August 8th.—Conducted experiments to-day which relate to sapping.* Fired 30-pounder Parrott rifle projectiles into a sap roller; ascertained "constants of work" (work of one man for one hour) in a trench; also penetration of rifle balls into wet and dry sand, fascines, pine planks, and palmetto logs.†

Began, to-night, an emplacement for one Wiard field gun in the salient on the left, and just in advance, of Battery Kearney. This gun had two embrasures; one for defence of the obstacle, the other for firing on Battery Gregg and Wagner. Other work in progress the same as yesterday.

This night I made a second full reconnoissance of all the ground inside the picket line, and located position of third parallel and approach to it, in compliance with instructions from the general commanding.

Sunday, August 9.—The engineering difficulties antici-

* See Note 13. † See Note 15.

pated at this time in the construction of the approaches against Wagner were,

First, The narrow front on which to conduct the operations, together with the scarcity of earth for covering masses, as heretofore experienced;

Second, The heavy cross-fire from Wagner and Sumter, Battery Gregg, and the James Island batteries, which will necessarily take in reverse and enfilade a part of our trenches; together with the vigilance, skill, and obstinacy of the enemy's sharpshooters.

Third, The difficulty of protecting the flanks of our parallels from being turned by the sorties of the enemy. At each low tide our right flank, as we progress, will be irreparably open. At all times, the dry, intermediate marsh, between mud and sand, on the left, endangers that flank; for this marsh is too wet to trench, but still entirely passable for troops.*

For the first difficulty there is no remedy; we can only make the most of what earth there is. Our counter-batteries, and the fire of the navy against Sumter and Wagner, together with the more efficient corps of sharpshooters† now forming, will lessen the amount of the enemy's fire.

To protect the flanks of our advanced parallels, two plans are proposed. First, To construct two nearly parallel lines of obstacle, (abatis or palisading,) extending toward Wagner, and keeping progress with the approaches, which lines will embrace all the ground fit for siege operations, averaging about seventy-five yards in width. This obstacle to be defended by the guard of the advanced trenches, assisted by an artillery fire from parallels in the rear, enfilading its fronts. Second, to build keeps (blockhouses,‡ or enclosed stockade works) in which the guard of the advanced trenches could take refuge, and make an independent defence, until support could arrive from the rear.

* See Plate III. † See Note 14. ‡ See Plate III.

The second plan was officially approved. It will require far less material than the first. This material is brought from Folly Island, and carried from the second parallel forward by men.

I was ordered by the general commanding to direct the opening this night (August 9th), by the flying sap, of a third parallel,* three hundred and thirty yards in advance of the right of the second, and five hundred and forty yards from Wagner, and construct an approach to it from the obstacle of the second parallel.

My official instructions relating to these approaches against Wagner were, to devote only my spare men to them, attending more particularly to keeping in repair and strengthening the works already built in the second parallel. My daily details at this time were three hundred men.

I was informed that these approaches would probably only amount to a feint, as on the demolition of Sumter the monitors can invest Morris Island, and thus reduce Wagner and Battery Gregg.

The detail for to-night's work is one hundred and twenty-four volunteer engineers, under Lieutenants Farrand and Talcott, and eighty infantry, under Captain Walker. The engineers were in advance. Two hundred and sixty yards of trench was opened, and a splinter-proof parapet, from six and a half to eight feet high built throughout its length. No portion was revetted. Our grand guard outposts were but thirty yards in front of the working party, and the enemy's pickets, who could be seen, were apparently not over thirty yards further. The engineers, on their knees, shoveled almost noiselessly. I could scarcely hear or see them from the line of outposts, thirty yards distant. The following method of setting the engineers at work was adopted. They carried no arms. Each man held a short-handled shovel in his right hand; in the left, at intervals

* See Plate III.

of six feet, each grasped a marked rope. The engineer officer who located the line took the lead. The men marched forward, stooping. At a signal the rope was dropped, and each man went to digging a pit where he stood, throwing the earth over the rope. These pits were connected, and good cover was soon obtained.

Sandbag loopholes were built in the third parallel for the use of the sharpshooters who occupied it next day.

Monday, August 10.—This night perfected the defensive arrangements of the third parallel. Built banquette tread with sandbags, strengthened the parapet, built a barbette for a Requa battery* in salient angle near the centre of the parallel, and began to set palisading to enclose the keep, in a dyke which fortunately ran in the right direction.

At about two o'clock on the morning of the 11th, when the last-mentioned work was about one-half completed, Wagner opened a heavy fire of grape, canister, and shell, which, with the fire of the James Island batteries and Sumter, stopped our working parties entirely for the first time in the siege. Lieutenant Farrand, who had charge of the work, supposed that the tall palisading, which was set across the gorge of the keep, attracted the fire. This is the most spiteful fire delivered landward by Wagner since the 18th July. Indeed, this work has been very quiet since that time for fear of drawing the fire of the heavy guns of the navy, and that of the land siege batteries upon it. Our reply to all the enemy's fire, from whatever direction, has been directed against Wagner.

Lieutenant Wilcken began the construction of the defensive splinter-proof shelter,† for the reserve of the grand guard, in front of the second parallel.

Doctor Grant undertook to-night to light up Cummings Point with two calcium lights, placed in the left batteries, distant three thousand yards. The object was to reveal to our gunners any of the enemy's succor-boats that may be

* See Note 16. † See Plate III., section hh'.

attempting to communicate with his forces on Morris Island, and interrupt the operations with our fire. On the night of August 4th Captain Payne, the scout, and party, were captured while repeating their endeavors to discover these relief boats. Neither plan fully succeeded.

Tuesday, August 11th.—As is usual after particularly heavy firing, it is very quiet on both sides to-day.

Up to this time no fascines or gabions have been used on the right, nor are there any considerable number on hand in the department. To-day their construction,* together with that of sap rollers,† was begun on Folly Island, by a detachment of engineers under command of Lieutenant Henry Mehles, New York Volunteer Engineers. This work soon passed from under my direction to that of the commander of the engineer depot.

In an official communication made to-day, I stated that "on account of the scarcity of material in this vicinity, and lack of men for fatigue duty, I would recommend that one non-commissioned officer and six artificers of volunteer engineers be sent to Hilton Head to instruct fifty infantry, who should be detailed for this purpose, in the duty of making gabions and fascines." This work was ordered to be commenced at Beaufort by engineers already there.

The reason that sand bags,† which are far more expensive and require more labor, have been used in place of gabions for revetting is, that the latter leak the dry sand rapidly, hence cannot be used. The gabions used about embrasures were often filled with sand bags.

I reported in writing to-day to the general commanding concerning "the great inconvenience and extra expense we are incurring in our engineering operations in the second parallel, (in magazine floors, revetting and splinter-proof shelters) from the want of lumber." I was informed that the foot causeways over the marsh were consuming it.

To-night continued last night's unfinished work. Cap-

* See Note 9. † See Note 10.

tain Suess finished the surf battery. This is the last work, except repairs, done on the defensive arrangements of the second parallel. This seaward work could only be carried on at those low tides which occurred in the night. The palisading which closes the gorge of the keep of the third parallel was completed, as was also the emplacement for the Requa battery in its salient. Built twenty lineal yards of splinter-proof shelter in the north end of the approach to the third parallel. Built a traverse* arranged for musketry defence on the right and twenty yards to the rear of the third parallel, to defend its right flank. This traverse afterward became the parapet of two successive mortar batteries. Began to extend an abatis along the front of the keep, thus entirely enclosing it by an obstacle.

Wednesday, August 12th.—Lieutenant Talcott reports, "that, in accordance with instructions received from you last evening, I had charge of work in and in front of the second parallel. Owing to a heavy fire from Wagner, we did not commence our work until 11 o'clock, and consequently did not accomplish as much as could be desired. The infantry detail (colored troops†) broke at the first fire, near the entrance to the approaches to the second parallel, and became so scattered that it was impossible to collect them again. This would have been prevented by the presence of more commissioned officers, there being but one lieutenant with one hundred and seventy-five men."

The want of a sufficient number of good officers with the infantry fatigue details was frequently felt. Regimental and brigade commanders too often seem to consider that second-rate officers, and but few of them, will answer for fatigue duty. Soldiers usually work with reluctance. "I did not come to war to work, but to fight," is often heard from the infantry private. If the officers and non-commissioned officers commanding details sympathize with this idea, and take no interest in the duty to be performed, the

* See Plate III., section gg'. † See Note 19.

position of the engineer officer in charge is very unpleasant. "Too much pains cannot be taken," says a celebrated engineer, "to prevent the recurrence of a feeling so radically opposed to the success of siege operations."

The parapets of the approaches in advance of the second parallel were strengthened to-night.

The fire of the enemy's sharpshooters was particularly brisk during the day.

Thursday, August 13.—To-day I was instructed by the general commanding to attempt no further advance of our approaches against Wagner (which henceforward will have to proceed, in part at least, by the full sap) until our batteries open on Sumter, which will be in a few days. These batteries will then silence a portion of the enemy's fire and attract a part of it to themselves. Nearly all this fire is now directed on our advanced trenches. In the interim to complete the defensive arrangements of the third parallel, thoroughly repair the whole line of approaches, and complete the final arrangements for opening the breaching batteries.

The magazines in the second parallel were to-day floored with lumber just obtained. I sent a party to pick up some plank in the creeks west of Morris Island, not used in the construction of the marsh causeways. It was hauled to the creek near Battery Hays, and afterwards rafted to the left of the second parallel.

Continue to get iron from the wreck of the Ruby to be used as lining for embrasures,* also for mantlets for the heavy guns. Seven iron linings are already in; three in the surf battery and four in Battery Kearney. They work well thus far.

During the night the line of abatis in front of the third parallel was finished, thus completing the keep. The services of the Thirty-ninth Illinois Volunteers are highly

* See Note 12.

spoken of, in connection with this work, by the superintending engineer officer.

Improved the embôuchure of approach from second parallel to make it passable for carts.

At the request of Colonel Turner, Chief of Artillery, bullet-proof merlons* made of iron gabions filled with sand bags, were begun in Battery Brown under Sergeant Felter, New York Volunteer Engineers. To accomplish a similar end (the protection of the artillerists from Wagner's sharpshooters,) the soles of the embrasures of Battery Kearney are given a counter slope.

Friday, August 14.—Since the occupation of the third parallel by our sharpshooters, those of the enemy have given much less annoyance to the second parallel, as they have been driven further back, and their attention fully occupied by our advanced riflemen. This gives opportunity for more day work in the second parallel, and accordingly, from this time forward, an engineer officer will be constantly on duty there, which has not been the case heretofore.

To-day, for the third time, the trenches to the rear of the second parallel were cleaned out, and their parapets rebuilt. Continued work on splinter-proof shelters† between the first and second parallels, it being designed, if the enemy's fire continues annoying, to build cover for the entire guard of the trenches and the artillerists, altogether at least one thousand one hundred men.

This night added sand to the covering of all the service magazines in the second parallel, to supply waste caused by the wind. They are now receiving powder.

Continued splinter-proof merlons for heavy guns, and commenced, at the request of Colonel Turner, Chief of Artillery, putting boiler plate mantlets in their embrasures, to give the gunners additional protection against sharp-

* See plate III., section aa'. † See Plate III.

shooters. But little use was made of these mantlets. After the fire opened on Sumter, the enemy's sharpshooters directed their attention to the sappers, who then commenced their advance.

To-day was built, at the request of the Chief of Artillery, a small splinter-proof magazine, in which to load shells for the use of Battery Brown.

Saturday, August 15.—Portions of the sand bag revetting of the second parallel are failing. The dry sand runs out through rents made in the bags by the service of the defensive guns, and the destructive operations of the guard of the trenches in their efforts to shelter themselves from the sun and the night air. It is probable that many of the bags that are giving out are the ones that had been already once used in revetting the siege batteries on the north end of Folly Island, and a second time here for want of better. This can only be remedied by replacing or facing such revetting with new. The latter plan was adopted, and a poor quality of sods cut from the marsh was used. This work was begun in the howitzer battery,* on the right of the second parallel, and, with the unfinished work of yesterday, is in progress this day and night.

The mortar schooners have been firing on Wagner yesterday and to-day. One of their shells dropped in our advanced trenches and killed one man.

It is anticipated that the sap will have to advance from the third parallel against an artillery fire from Wagner more or less severe, and, as it is believed that the fort has at least one rifled gun bearing this way, serious annoyance is feared. To advance under this fire a system of blinded direct sap, or surface mining, has been considered and experimented upon. It is intended to protect the approaches from all horizontal, and from the splinters of vertical fire. This method could not be employed, as was afterwards ascertained, because it required a depth of four feet

* See Plate III., section bb'.

of earth, which could only be found for a very small portion of the distance.

Captains Joseph Walker and John L. Suess have been detailed on sapping duty, and are now engaged in drilling four brigades of sappers from Companies I, B and D, New York Volunteer Engineers. The full sap, revetted with gabions, and without any revetting material whatever, has been executed for practice. In the latter method, the parapet is kept closed upon the sap-roller, which is moved forward but a few inches at a time. Captain Walker is the special advocate of the last plan, which was afterward chiefly used, and found to work well. It is slow, but has the advantage of not requiring instructed sappers or revetting material.

Sunday, August 16.—To-day, Lieut.-Colonel Sleeper, Fourth New Hampshire Volunteers, with a detail of thirty men from his own regiment, is making gabions on Block Island. The same work is in progress on Folly Island, under Lieutenant J. H. Harold, New York Volunteer Engineers.

Built a splinter-proof shelter in rear of Battery Kearney, for use of artillerists serving its guns. Continued repairs on revetting of second parallel. Three hundred and sixty lineal yards of wide and narrow splinter-proof shelter,* capable of accommodating over one thousand men, are finished, and the work of its construction is suspended for the present. Corporal Stinhilber, Company D, New York Volunteer Engineers, assisted in its erection.

Brigadier-General A. H. Terry, commanding forces on Morris Island, requested, to-day, that a parapet be built sufficiently strong to shelter the brigade which will be stationed near the Beacon House, as a reserve during the bombardment, which is to begin to-morrow morning. The general commanding approved the plan. Accordingly, this night, Captain S. C. Eaton, New York Volunteer En-

* See Plate III.

gineers, with an infantry detail of three hundred men, built seven hundred and fifty yards of splinter-proof parapet, six and a half feet high, extending from the Beacon House* southerly along extreme high water line. At the same time, Captain Graef built the approach from the Beacon House to the first parallel, thus supplying a link, the want of which, for its moral effect on the men entering the trenches, has frequently been felt.

Twenty-five sand bags for each breaching gun were filled and piled up in rear of the batteries, to be used for repairs during the fight. A large quantity of engineering material, consisting of sand bags, gabions, fascines, lumber, hides, ropes, spikes, abatis material, &c., is collected at the engineer service depot in the second parallel, for use in repairs during the bombardment.

About midnight a shell from Wagner penetrated the splinter-proof shelter used as headquarters and telegraph office,* in the second parallel, wounding Colonel Howell, general officer of the trenches, and two others. The necessary repairs were immediately made by Captain Walker, who was on duty, replacing the sand bag revetting of the embrasures of the howitzer battery with gabions and fascines.

The fire from Wagner, although inflicting much less real injury, up to this time, than the aggregate fire from the other batteries of the enemy, still gives far greater interruption to the working parties, on account of our nearness to the fort. "Cover—Johnson or Sumter," gives sufficient warning for those in the trenches to seek partial shelter, if the shell is seen to be coming toward them; but "Cover, Wagner," cannot be pronounced before the shell has exploded and done its work. At these cautionary words, I have often observed soldiers, particularly negroes, fall flat on their faces, under the delusion that they were obtaining cover from mortar shells exploding over

* See Plate III.

them, when, in truth, their chances of being hit were much increased by this posture. On one occasion a soldier was observed to place an empty powder barrel over his head, to shield him from heavy shells.

The enemy's fire was heavier than usual to-day, but has done but little injury to our men or material.

Monday, August 17.—All the heavy rifle guns on the right, excepting one that was accidentally spiked, and so many as are ready on the left, with the Naval Battery, opened fire on the gorge wall of Sumter this morning at sunrise.

The navy, together with the siege pieces in battery on the land, fired on Wagner a considerable portion of the day, to prevent it from opening fire on the breaching batteries of the second parallel.

Two engineer officers were on duty during the day, to make repairs in the second parallel. None of importance were necessary.

The booms* on the left of the second parallel were fixed to-night by Sergeant Scott, New York Volunteer Engineers, having been moved by the spring tide. Gabions and block-house material were carried forward to the third parallel. Continued to increase the covering of service magazines for breaching batteries.

Tuesday, August 18.—Firing on Sumter is continued to-day. This afternoon the spring tide, which is now at its height, was fearfully increased by a northeast storm. Nearly the whole line of trenches contained water, from a few inches to two feet in depth. One-third of the parapet of the surf battery† was carried away, and the sea broke over it so furiously that its two guns had to be removed.

This night the general commanding ordered the full sap‡ to be started from the left of the third parallel. Accordingly, the trench of this parallel was cleared out and

* See Note 3. † See Note 4. ‡ See Note 13.

widened, the parapet strengthened, and the debouch made. A Requa battery was placed in position on the extreme left of the third parallel, to enfilade the front of the parapet of the proposed sap. Sap rollers and sapping tools were carried forward. The extreme high tide, requiring the men to work in mud and water, greatly interfered with all these operations.

Wednesday, August 19.—This morning at two o'clock, the water having so subsided as to render it possible, the full sap was started from the point above indicated, by Captain Walker, with a sapping brigade, consisting of ten men from his own company, I, New York Volunteer Engineers. He had executed sixty feet at 8 o'clock A. M., and was then relieved by Captain Suess, with a sapping brigade from his company, B, same regiment, who completed seventy feet of approach during the day. The enemy's sharpshooters opened on the head of the sap as soon as they observed its progress in the morning, and fired at it all day. One casualty occurred among the sappers, a slight wound from the explosion of a shell. Captain Walker again took the advance this night, and, by means of the flying sap, executed about one hundred and sixty yards of approach, leaving the sap roller at daybreak in position several yards in advance of our picket line.

In the second parallel, during this day and night, a force has been repairing the damage done by the storm. The two field guns, which had to be removed from the surf battery, are being put in position* at high water line, six yards in advance of the parapet of the second parallel. The merlons of the breaching batteries have received some repairs. Lieutenant Baldwin relieved Lieutenant Farrand on this work.

At the request of the officers in charge of the sap, I today prepared instructions for the guard of the advanced trenches. They received the approval of the general com-

* See Plate III.

manding, and went into operation this night. Three regiments, averaging three hundred men each, were assigned to alternate as guard of the advanced trenches. The Third New Hampshire Volunteers, Captain Randlett commanding, went on duty to-night.

The commander of the detachment making gabions on Folly Island reports that he has sent to Lighthouse Inlet three hundred and fifty gabions, and for the future sixty will be furnished per day, or about one gabion to two men employed. This is small work. It was soon afterwards more than doubled.*

Thursday, August 20.—Captain Walker was relieved in the sap this morning by Lieutenant Wilcken, who was relieved by Captain Suess, who was relieved in the evening by Lieutenant Charles B. Parsons, New York Volunteer Engineers, each tour of duty being about six hours long. The sap progresses very slowly, but constantly. The soil is easily worked, but averages less than two feet in depth to the water; hence the slow progress in keeping a strong parapet closed up against the sap-roller. Three sappers were slightly wounded to-day.

Completed emplacements and a barrel splinter-proof magazine† for two howitzers in second parallel, begun yesterday. Increased the size of left epaulement of Battery Meade, to secure its guns against an increased fire from James Island, as the enemy are opening new batteries in that direction. The frame of the bomb-proof surgery, which shows evidences of failing, has been braced and strengthened to-day. The repairs made in the embrasures of several breaching guns in the second parallel consist chiefly in replacing the iron gabions‡ which are worn out by new ones. In these repairs of embrasures, both of defensive and offensive guns, in the second parallel, it is observed that those having iron lining§ require the least, in

* See Note 9.
† See Plate III., section bb'.
‡ See Note 9.
§ See Note 12.

fact almost none. Captain Comstock, commanding Battery Rosecrans, says of the iron embrasure of gun No. 1, which had a boiler plate hanging door for a mantlet: "It worked very well indeed, until disabled by a shot. I consider it a good protection against musketry fire. It was not in my way in the least in loading and sighting upon Sumter."

Lieutenant M. Adams, Fourth New Hampshire Volunteers, was detailed, at my request, for engineer duty, and reported to-day.

The 10-inch Parrott rifle on the left has opened fire on Fort Sumter.

The Marsh Battery against Charleston city is completed.

Friday, August 21.—Captain Walker reports that he relieved Lieutenant Parsons in the sap at 3½ o'clock A.M., at which time the enemy were directing a heavy fire of grape and canister on it; which fire ceased before daylight. This permitted him to place a line of gabions on the reverse side of the trench to shield the sappers from the enemy's sharpshooters, who, it was feared, would occupy the cover furnished by the old ruins* to the front and left of the head of the sap. This they endeavored to do at daylight, but were prevented by our sharpshooters, who had been stationed by the captain for this purpose, so as to command the approach to these ruins. At about nine o'clock an artillery fire was opened upon the head of the sap from Wagner. Several shells burst directly over it, others entered the parapet and grazed the sap roller. The fire of the sharpshooters was constant and accurate. At 11½ o'clock A. M. Lieutenant Wilcken took charge of the sap, but was soon obliged to retire on account of the enemy's artillery fire, and that of his sharpshooters, who reached the ruins above referred to during a flag of truce.

On being informed of these facts by the general com-

* See Plate III.

manding, the naval commander opened on Wagner a fire from his vessels, which, to a considerable extent, subdued the fire of the work.

At my request, General Terry ordered the One Hundredth New York Volunteers, Colonel Dandy commanding, (the guard of the advanced trenches,) to endeavor this night to drive the enemy from behind a small ridge,* one hundred and fifty yards to our front, where their picket reserves were stationed, and which was the only natural cover outside of Wagner. We hoped and expected to have obtained a lodgment here by the flying sap, which would bring us within two hundred yards of the fort. Several efforts were made, which caused brisk skirmishing and the loss of six men, but we did not get the ridge. The picket line settled down in nearly the position occupied last night. I examined the ground, and concluded to establish a fourth parallel,* in order to secure possession of the ruins on the elevated ground to the left, from which the enemy's sharpshooters had long given us so much annoyance, and to increase our front preparatory to another attempt to take the ridge. This parallel, comprising a lineal development of three hundred yards, was opened from the beach to the marsh, close along the heels of our outposts, (its right being three hundred and fifty yards from Wagner,) by Captain Suess. He reports most part of the work was done by means of the flying sap, the engineers placing the gabions and the negro troops (Third Regiment United States Colored) digging the trench. The part on the left, near the ruins, being constantly swept by the enemy's musketry fire, was performed by the full sap; not, however, using the sap roller, as a flank fire only had to be provided against.† The details for this advanced work this night were one hundred infantry and fifteen engineers.

The same repairs and improvements are in progress in

* See Plate III.

† *I. e.*, "half full sap." See Note 13.

the second parallel as yesterday, and under the same officers.

Seventeen 8-inch Parrott rifle projectiles were fired from Battery Brown at Wagner to-day. Each threw up large quantities of earth, but did no serious injury to the work, so far as could be observed.

Saturday, August 22.—No attempt to advance the sap was made to-day. The sappers and an infantry detail were employed in strengthening the fourth parallel, widening trench, building banquette tread and loopholes for sharpshooters.

To-day I reported in writing to the general commanding the facts above recorded, relating to the progress of the sap for the past twenty-four hours; also that "one Requa battery* was mounted last night on the right of the first line of approach to the rear of the fourth parallel,† so placed as to enfilade its face and the beach. Another battery of this kind is about fifty yards in rear of the fourth parallel, near the centre of the island, and taking this parallel in reverse. Two other Requa batteries are in the third parallel. These four light defensive pieces comprise all the artillery in position in advance of the second parallel.

"I think it will be impossible to continue the sap in the daytime under Wagner's artillery fire. But if our picket line continues to advance, which can only be done with considerable loss, we may make some progress each night. Should the enemy's pickets retire inside his work, which they will soon be forced to do, he will then maintain an artillery fire from his light guns in the fort, which will make it impossible for the sap to progress night or day until this fire be subdued or kept down. His light guns are now run behind the merlons of the work to avoid our shot; hence it is only by destroying the parapet of the fort with our heavy guns in the second parallel, thus un-

* See Note 16. † See Plate III.

covering them, or by rendering their service impossible by a superior fire from light pieces which can be mounted on the fourth parallel, assisted by a strong force of sharpshooters, that we can proceed with certainty. (Our light guns in the second parallel cannot be used effectively against Wagner, on account of the distance, and the fact that their fire endangers our own men in the advanced works. Five, I am informed, have already been injured.) Destroying the parapets I consider the best plan, for, so long as the enemy is so strongly intrenched in Wagner he will give us serious annoyance, and possess an excellent base, from which to assault our works, which he must more than ever be convinced is his only hope." The general commanding expressed himself unwilling to risk a battery of light guns in the fourth parallel, and not yet ready to spare any considerable amount of the heavy gun fire of the second parallel from Sumter.

Captain W. Pratt, Fifty-fifth Massachusetts Volunteers, having been detailed by Brigadier-General Vogdes, at my request, for engineer duty, reported to-day.

The following instructions are approved by the general commanding, and take effect immediately:

HEADQUARTERS DEPARTMENT OF THE SOUTH,
ENGINEER'S OFFICE, MORRIS ISLAND, S. C.,
August 22, 1863.

Instructions for superintending engineer officers employed on the right and in advance of the first parallel, under direction of Captain Brooks, A. D. C. and Assistant Engineer.

I. The sap which is in progress toward Fort Wagner is in charge of Captain Walker, assisted by Lieutenant Parsons, and Captain Suess, assisted by Lieutenant Wilcken, New York Volunteer Engineers.

Twenty-five men from Company I, under Sergeant Stickle and Corporals Brooks and Leongtoe as chiefs of

sap; twelve men from Company B, under Sergeants Fiene and Huebbers as chiefs of sap; and twelve men from Company D, under Sergeants Buerkle and Spilker as chiefs of sap, New York Volunteer Engineers, will be formed into four sapping brigades. The above-named officers will arrange their brigades, times of relief, &c., as they may see fit. One-third the length of the sap must be fitted for infantry defence. The advanced guard of the trenches will furnish a constant detail of twenty infantry for duty in the sap, in accordance with written instructions given them.

Captain Walker and Suess will each report progress of themselves and assistants daily, according to enclosed form.

II. Captain Graef and Lieutenants Farrand, Talcott and J. S. Baldwin, New York Volunteer Engineers, Captain Pratt, Fifty-fifth Massachusetts Volunteers, and Lieutenant Adams, Fourth New Hampshire Volunteers, will relieve each other on the work specified in Section V. below, alternately at 8. A. M., 4 P. M. and 12 midnight each day, according to roster kept at this office.* These officers will receive notification of their turn from this office. All officers will also report here for instructions before going on duty with details, except the one going on at midnight. Each officer will confer with the one he relieves concerning the work, continuing what has been begun, and beginning such new work as may be necessary.

III. Fatigue details consisting habitually of nineteen engineers and seventy-five infantry, will relieve each other at 4 A. M., 12 M. and 8 P. M., reporting to the engineer officer in charge of the works at the engineer service depot second parallel. The rendezvous of the fatigue details is on the beach opposite the look-out where the engineers and infantry will meet at the hours herein specified, the senior non-commissioned officer of engineers conducting the united details to the trenches.

* See Note 18.

IV. The headquarters of engineers in the trenches* is in the splinter-proof shelter to the rear of the general magazine in the second parallel. Engineering tools, materials, service carts, &c., are in charge of Corporals Crane and Chandler, New York Volunteer Engineers, at engineer headquarters.

V. The duties to be performed by the group of officers designated in Section II., are to keep in as perfect condition as possible all the various defensive and offensive works in front of the first parallel, except the advance of the sap, which is in charge of a special detail. (See Section I.)

The more important works to be looked after are the following:—

1st. One general and two service magazines. These must be kept constantly covered with eight feet of earth on the shortest line from the surface to the sheeting. As the wind is continually removing this covering, it will be necessary to examine it with an iron sounding rod at eight o'clock P. M. each day, and the earth increased during the night if necessary. The interior of the magazine to be examined at the same time, in order to ascertain if the floor be damp, or timber work give evidence of failing. Entrances to magazines to be kept revetted and in good condition for ingress and egress.

2d. All the defensive and offensive batteries are to be examined twice in each tour of duty, and inquiries made of their commanders as to their condition. All injuries by the enemy's shot, wear and defects to platforms, embrasures, revetting, parapets and traverses, are to be thoroughly and promptly repaired.

3d. The musketry parapet in the second and third parallels and approaches (where they are arranged for defence,) must be kept in good defensive condition, *i. e.*, trench free from obstructions, and ten feet wide, banquette

* See Plate III.

at least two feet wide and smooth, breast height revetted four feet six inches high, superior slope smooth and having a slope of one to ten outward.

4th. A material obstacle, consisting of inclined palisading, abatis, wire entanglement, and floating booms, extends along the front of the second parallel, from low water on the right to the west side of the creek on the left. This must be so increased and kept in repair as to constantly present throughout its length a formidable obstacle to the advance of the enemy, so that it would be difficult to get through, even if there was no fire defending it.

5th. Splinter-proof shelters, injured by the enemy's projectiles, must be repaired, and at least two feet of earth kept constantly on them.

6th. The parapets of the approaches must be kept (when other work will permit) six and a-half feet high and three feet thick on top, the trench inside being ten feet wide and free from obstructions.

7th. Within three hours of the close of his tour of duty, each officer will send to this office a report, according to the enclosed form, showing number of men employed, work completed, work begun, material used, material required, name of officer who relieved him, etc., making such statements as regards the work, as may prove useful or interesting.

Soon after, the following supplementary instructions were added to the above, in the form of a

CIRCULAR.

In order to facilitate the work of the sap, the officers in charge of that work will hereafter relieve each other at the same hours as the officers in charge of the other engineering work on the right, viz.: at twelve o'clock midnight, at

eight o'clock A. M. and four o'clock P. M. The officers are directed to be on hand promptly at these hours. Officers unfit for duty will please report the fact four hours before their tour begins, that other arrangements may be made.

Sunday, August 23.—Captain Suess went on duty in the sap at three o'clock this morning. He extended the fourth parallel to the marsh, and by means of gabions a short distance out upon it. At daylight the enemy opened on this new work with artillery from Wagner and completely destroyed it, knocking the gabions to pieces, and caving the parapet back into the trench for twelve yards in length. This part of the work had to be abandoned, and as it was not thought advisable to start the sap roller, under the circumstances, the day was spent in improving the fourth parallel.

The enemy in Wagner have become very expert in filling the throats of their embrasures with sand bags after each discharge, thus shielding the detachments serving the heavy guns from our sharpshooters and even our artillery.

Two emplacements for defensive guns (Requa batteries) are building on left of the fourth parallel to-day.

To-night Captain Walker is on duty in the sap. A small "redan"* was built in front of the left of the fourth parallel, by the flying sap, the enemy's pickets being within twenty-five yards. This increased the development of the parallel, perfected its flanking arrangements, and gave cover in reverse against our own fire, and what was still more important, against the fire of James Island, which is producing more casualties† among our troops than at any previous time, averaging in the special guard of the advanced trenches, ten per day. On one day one of these regiments, the Eighty-fifth Pennsylvania Volunteers, numbering three hundred men, lost twenty men.

One Requa battery was placed in position on the left of

* See Plate III. † See Note 18.

the fourth parallel this night. A return of twenty-five yards extending along the marsh, was made from its extreme left to protect that flank. A light musketry parapet built of gabions for the same purpose, has already been established on a dyke* leading from near the left of the fourth parallel to the creek.

Captain Pratt this night superintended moving sap rollers to the left of the fourth parallel. Also to the same place a coehorn mortar battery with its platforms and ammunition from the left of the second parallel.

In addition to the ordinary repairs in the second parallel, the parapet of the approach between it and its obstacle was this night raised by means of a row of powder barrels† filled with earth. These powder barrels, emptied by the firing, have also been used to a considerable extent in the fourth parallel for revetting† and for a banquette tread. The parapet of the third parallel, and of the line of approach immediately to its rear was thoroughly repaired and strengthened. Began the construction of emplacements for four 8-inch siege mortars in rear of the traverse which defends the right flank of the third parallel, with a bomb-proof magazine for the service of the same; also to move forward from the first parallel the platforms belonging to this battery.

This evening the "seven day's bombardment of Sumter" which began on the 17th inst. ended in thoroughly demolishing the gorge wall of the fort, dismounting most, if not all of its guns, and greatly injuring its walls.

Monday, August 24.—From the salient of the redan to the end of "the ridge" occupied by the enemy's pickets and sharpshooters is a distance of twenty-five yards. Intermediate is a strip of low wet ground* submerged at spring tides, which will render it very difficult, if not impossible to continue the sap in this direction under a severe fire.

* See Plate III. † See Plate III., section cc'.

To-day last night's work was strengthened and perfected. Three coehorn mortars were put in battery in the fourth parallel,* and a bomb-proof magazine for their service begun. This afternoon a mortar was opened on our fourth parallel from Wagner. Three sappers were wounded by it. This mortar proved to be a great annoyance. Its fire was directed on the head of the sap, was very accurate, and our sappers had no shelter from it. Six such mortars well served would, I think, have stopped our work at this period, until subdued by our superior fire. This night the full sap was started from the salient of the redan,* being the prolongation of its left face. It had been carried forward but a few yards, when a severe rain storm filled the trench with water which could not be drained off because the ground was too low; the work, in consequence, made very little progress. The enemy were so near (not more than twenty yards distant) that it was impossible to employ the flying sap.

Captain Graef, on duty in the second and third parallels to-day, reports: "The platform of 8-inch Parrott rifle, gun No. 1, Battery Brown, had settled in the rear nine inches, so that the gunners were afraid to fire the gun. I raised it level. The other platform will have to be raised in the same manner, after a few more days' firing." This is occasioned by the recoil of the gun, which causes the front of the platform to spring up. The dry sand running under, prevents it from settling back to its original position. Captain Graef continued work on the mortar battery in the third parallel. Lieutenant Farrand followed him, and finished the battery and magazine, and reported it ready for its armament this evening. He also widened the trench leading to the third parallel, to admit the passage of a sling cart. These mortars were mounted during the night.

Lieutenant J. S. Baldwin this night built a causeway

* See Plate III.

over the marsh, from the boom across the large creek on the left of the second parallel, about three hundred and seventy feet in a northwesterly direction, to the second creek. A platform was built at the farther end, and a light traverse for the accommodation of a grand guard outpost.

Captain Pratt's detail completed the bomb-proof magazine in the fourth parallel, and built a barbette emplacement for a Requa battery near the centre of the same. He reports that "the severe rain and intense darkness" interfered greatly with the progress of the work. One boat howitzer was mounted on the left of the fourth parallel, making the armament of this parallel three light defensive guns and three coehorn mortars.

Tuesday, August 25.—Some sharpshooters, who occupy pits just in front of the left of the fourth parallel, annoy us greatly. They are on lower ground than we, hence enabled to see when our loop-holes are darkened by the heads or rifles of our sharpshooters. In order to flank, and thus dislodge this troublesome enemy, an attempt was made this morning to prolong the right face of the redan from the salient; but the mortar fire, and, what was worse, the water which constantly filled the trench as it was dug, rendered the progress so slow that the enemy had time to protect his pits against us.

Experience now proves that the sap cannot proceed further, unless the artillery fire of Wagner be subdued, or the enemy be driven out of the ridge in which they confront us so closely and securely. The general commanding approves of an effort being made to drive them out of this ridge with mortars this evening. For this purpose the three coehorns were moved and mounted in the redan, in which position they more nearly enfiladed the ridge with their fire. During the afternoon the heavy guns in the second parallel fired on Wagner. At 5½ o'clock P. M., the four 8-inch mortars in advance of the second parallel,

and the three coehorn mortars above referred to, opened on the ridge. At the same time the navy howitzer, served by Ensign Wallace, United States Navy, and Requa battery on the left of the fourth parallel, fired to enfilade the reverse of the ridge. Owing to some fault in the ammunition or service of the 8-inch mortars, their fire was very inefficient. The enemy not only remained in the ridge, but were reinforced just at dusk, when brisk musketry firing took place, which lasted for half an hour. The two Requa batteries* in the fourth parallel took part in this skirmish. Although not well served, their firing was such as to confirm my previous favorable impression of the gun for defence of earthworks.

The fire from the James Island batteries has been very accurate, and much felt in the fourth parallel to-day. Several casualties took place among the engineers and infantry. I witnessed three successive shot take effect among our troops. This is surprising, as the enemy is using smooth-bore guns, at ranges of from three thousand to four thousand yards. Provoked by our shelling the ridge, the enemy opened on us, about sundown, the heaviest artillery fire† yet directed on the advance, which was continued through the early part of the night. I think he anticipated an assault on Wagner, although that work fired but very little. Additional traverses against this enfilading fire were built to-night. The propriety of building a keep against sorties on the fourth parallel, as was done in the third, and in accordance with the original plan,‡ was discussed to-day, but the general commanding did not order it.

There was nothing to do in the second parallel, its works being in good condition.

This has been to me the saddest day of the siege. Less has been done in existing works than on any other; no

* See Note 16. † See Note 18. ‡ See page —.

advance has been made, nor does any seem possible. Something besides spades and sharpshooters will have to be tried. The troops seem to be resting from the labor and excitement of demolishing Sumter, and do not yet take much interest in the operations against Wagner.

The engineer officers of the sap express the earnest wish that the enemy be driven out of the ridge with the bayonet, and that our superior artillery fire be directed on Wagner. This would enable us to cross the very difficult ground immediately in our front, obtain a lodgment in the ridge, which is very favorable, and thus make a long stride toward the fort.

The embrasures of all the heavy guns on right and left are ordered to be arranged to embrace Wagner in their field of fire.

Wednesday, August 26.—No work worthy of record was done during the day.

The general commanding ordered General Terry to take and hold "the ridge," and placed the resources of the command at his disposal for that purpose. It was accomplished at 6½ o'clock P. M., by a brilliant charge of the Twenty-fourth Massachusetts Volunteers, Colonel Frank Osborne commanding, supported by the Third New Hampshire Volunteers, Captain Randlett commanding. Sixty-seven prisoners were captured. They were afraid to retire on account of their own torpedoes,* as they informed us, and had too little time, even if there had been no torpedoes. No works, except rude rifle-pits in the excellent natural cover afforded by the ridge, were found. Sand bags of a superior quality had been freely used for loop-holes and traverses.

The moment the ridge was gained, the work of intrenching was begun under the superintendence of Captain Walker. The fifth parallel† was opened from the sea to

* See Note 5. † See Plate III.

the marsh, a distance of one hundred and forty yards, advantage being taken of the enemy's pits on the left, and cover was rapidly obtained, under the stimulus of a severe grape and shell fire from Wagner. The right of this parallel is two hundred and forty-five yards from the fort. In this work the Twenty-fourth Massachusetts Volunteers, proved themselves as efficient in the use of the shovel as they had in that of the bayonet a few moments before. From the right of this line an approach was at once opened by the flying sap. This was extended to the marsh, and later in the night the sap was continued to the beach, within one hundred yards of the fort, by a second line running near the edge of the marsh.* Not much work was done on this last line, on account of the water, and lack of time before day. On it the first torpedoes† were found. One exploded, throwing a corporal of the Third United States Colored Troops, of the fatigue detail, twenty-five yards, and depositing him entirely naked, with his arm resting on the plunger of another torpedo, which facts gave rise, on his being discovered next morning, to the absurd story that the enemy had tied him to the torpedo as a decoy. I was standing twenty yards from him at the time of the explosion, and Captain Walker much nearer. Both supposed that it was a shell from the enemy until late in the night, when other torpedoes were found.

The discovery of these torpedoes explains what has been, to me, one of the greatest mysteries in the defence of Wagner, *i. e.*, the fact that no material obstacle of any amount could be discovered in front of the work, not even after our two almost successful assaults. Torpedoes were the substitute.

Positions were built for two Requa batteries, one on the right, and one near the centre of the parallel on top of the ridge; the latter in an advanced position, in order to flank

* See Plate III. † See Note 5.

the line. An approach from the redan of the fourth to the fifth parallel* was built by the flying sap; the work was very difficult, on account of the mud and water, and was in charge of Lieutenant Wilcken.

Colonel Montgomery was this evening relieved as general field officer of the trenches by Brigadier-General Stevenson.

Thursday, August 27.—This day and night were employed in strengthening and perfecting the defensive arrangements in the fifth parallel, and the approaches to and from it. Completed two emplacements for Requa batteries, which were mounted at night. Built sandbag loopholes for sharpshooters, and banquette tread for infantry. Eight torpedoes were discovered inside of our advanced line to-day. In endeavoring to move, by means of a rope, one which projected into the ditch, it exploded. These torpedoes give us considerable trouble and anxiety, but they are an excellent obstacle to prevent a sortie by the enemy, who are very much afraid of them. Began this night to convert a large cistern found in the fifth parallel into a bomb-proof magazine. Opened, by means of the flying sap, a second line of approach from the right of the fourth to the fifth parallel, thus avoiding the mud.

The enemy fired all night from Wagner with their light guns and mortars.

I recommended to the general commanding to-day that "the battery of four 8-inch mortars now on the right of the third parallel be moved forward to the fifth parallel. For, in its present position, its fire endangers seriously our own men in the advance. From the fifth parallel, being within two hundred yards of Wagner, it could give the enemy very serious annoyance, judging from the effect of his mortar fire on us, at a greater distance. I also recommended that field guns be placed in battery in the fifth parallel, to aid the mortars in keeping down the light-gun fire of the fort, which has been very annoying the past two nights."

* See Plate III.

This was returned endorsed, "Positions will be prepared for the 8-inch mortars, and two field guns, in the fifth parallel, but they will not be placed there until further orders."

Friday, August 28.—Continued improvements in the fifth parallel. Moved three coehorn mortars forward into it. Continued work on bomb-proof magazine and construction of traverses against James Island fire. Began emplacements for siege mortars in compliance with orders.

Lieutenant J. S. Baldwin reports that "the torpedoes with which the enemy have obstructed our progress may be easily rendered harmless by boring a small auger-hole through the wood of which they are constructed and pouring in a sufficient quantity of water to destroy the explosive power of the powder." This was afterwards practiced.

Captain Suess reports, "it was intended, in compliance with instructions, to finish the most advanced branch of the approach, but there being full, clear moonlight all night, it was impossible to place the fatigue party in position. The already existing parapet was too low, and made much worse yesterday by the heavy rain, to afford concealment, and the trench was full of water," this being a period of spring tides.

I am instructed by the general commanding to increase the amount of cover for troops in and in advance of the fifth parallel to the utmost extent, in order to allow a large force to be massed there, preparatory to assaulting Wagner. This will be done by traverses, widening trenches, and additional boyaux.

Saturday, August 29.—Completed siege-mortar battery and bomb-proof service magazine in fifth parallel. This is the third time these peculiar mortar platforms* have been laid; they are still good. Built a splinter-proof

* See Note 11.

shelter for headquarters and for engineer service depot in fifth parallel.

I ordered the sharpshooters to-day to endeavor to explode the torpedoes in advance of our works by firing at their plungers. Hitting the plunger did not explode them.

It was bright moonlight to-night, and the enemy concentrated a sharp musketry and light artillery fire on the party who were strengthening the advanced line of sap under the supervision of Captain Walker. The fire destroyed the parapet, and one shell killed and wounded six sappers. The work was discontinued. Dark nights, or subduing Wagner's artillery fire will alone permit the work to advance.

A second bombardment* of Sumter began this morning, it being reported by the navy that one or more of its guns can be served.

The enemy's batteries on Sullivan's Island opened fire on our advanced works on the right to-day, but with little effect.

In General Orders No. 70, Headquarters Department of the South, this date, "Captain C. B. Reese, Corps of Engineers, United States Army, is announced as assistant and consulting engineer on the staff of the brigadier-general commanding the department. All orders connected with the administration of the engineer service will be transmitted through him, and he will have control of the collection and issue of all engineer material."

Sunday, August 30.—The unfinished work of yesterday is in progress to-day. As the moon shines brightly to-night, and the enemy are firing constantly, no attempt was made to advance.

Lieutenant-Colonel Purviance, commanding Eighty-fifth Pennsylvania Volunteers, was killed during this tour of duty as commander of the special guard of the advanced

* Not the bombardment specified as the *second*, in General Gillmore's Report.

trenches, by one of our own shells, which exploded prematurely.

Monday, August 31.—The cover for troops is being increased in front of the fifth parallel by means of numerous boyaux having high parapets directed perpendicularly to the resultant of the enemy's fire.

In order to bring a greater musketry fire on the beach to defend our right flank, a rifle trench is being built in advance of, and parallel to, the first line of approach in front of the fifth parallel.

This night being sufficiently dark to conceal our workmen, the advanced line of approach was thoroughly strengthened throughout its length, under the direction of Captain Suess. There was very little fire. All of the torpedoes inside our advanced lines were removed.

In compliance with instructions received through the consulting engineer, one sap roller was placed at the head of the sap, and one on the right of the fifth parallel this night. The parapets throughout the whole line of trenches are being greatly strengthened. Turf is being cut to cover the service magazines in the second parallel.

The Third United States Colored Troops, who have been on fatigue duty in the advanced trenches since the 20th instant, were relieved to-day by the Fifty-fourth Massachusetts Volunteers, (colored,) it being desirable to have older troops for the important and hazardous duty required in the advance at this period.* Infantry officers commanding fatigue details inform me that it requires much more effort to make the men work than fight under the same fire.

The firing on Sumter, which was resumed yesterday morning, ceased this evening. The last gun that had the appearance of being fit for service was dismounted.

This night three casualties occurred in the guard of the advanced trenches, from the explosion of a torpedo,† over

* See Note 19. † See Note 5.

the plunger of which one of the men crept in taking his position.

Tuesday, September 1.—I wrote to Captain Reese, consulting engineer, this morning, "I regret to be obliged to report myself unfit for duty to-day. I am scarcely sick, but having been on duty for fifty consecutive days, and the intervening fifty nights (except two) until twelve o'clock, I am physically exhausted, and will require a short period of rest to recuperate."

Lieutenant Peter S. Michie, United States Engineers, Assistant Engineer Department of the South, was assigned temporarily to the direction of the engineering operations on the right.

In compliance with instructions from the general commanding, the following record of Lieutenent Michie's operations is compiled from the reports of superintending engineer officers made to him, which were filed with similar ones made to me, in this office.

This day and night the parapet of the approaches from the head of the sap to the second parallel were strengthened, the trenches cleaned out, and some revetting done. A small magazine for the coehorn mortars was begun in the fifth parallel. Injuries by the enemy's shot to the large magazine in the second parallel were repaired, and covering the same with sod continued.

The enemy fired heavily all night.

Wednesday, September 2.—Continued work on strengthening parapet in advance of second parallel to the head of the sap, sod covering on magazines in second parallel and repairing ventilators to the same. Repaired injuries done by the enemy's shot to the mortar battery and magazine in the fifth parallel. Built traverses in the approach in advance of the fifth parallel.

The sap was started at seven o'clock this evening by Captain Walker. He reports, "I have started the sap in the new direction (deflecting 110° from the last approach)

and succeeded in putting in about fourteen feet when I was relieved. Not more than ten shovels full of earth had been thrown before the enemy opened fire, making the place a very hot one. Two look-outs were built for sharpshooters. The fascine parapet on the beach (on the right of this line) was raised three fascines high, and at the base laid ten fascines wide. It will require six more fascines, besides sand bags to finish it." A Requa battery was mounted in this position.*

Thursday, September 3.—The sap was continued to-day, but its progress was very slow, owing to the enemy's artillery fire, and that of his sharpshooters, who attained a position on the left of Wagner, which nearly enfiladed the trench.

Captain Suess reports, "I continued to work on the new sap by means of the full sap, except that no sap roller was used. Up to four o'clock P. M. eighteen feet had been executed, while the greater part of the whole line had been provided with a sand bag banquette and revetting. At this time I was disabled by a rifle shot from Fort Wagner, and had to quit the place."

This shot came from one of the enemy's sharpshooters, and cut off all the fingers from the Captain's right hand, as he was in the act of placing a gabion.

The head of the sap is now at the narrowest development (twenty-five yards) and least depth of earth (average of two feet) encountered in the whole line of approaches.† The enemy concentrate a heavy fire of artillery and musketry on it at the short ranges of from one hundred to three hundred yards. Destructive torpedoes, having a delicate explosive apparatus, are planted thickly in the path.

Began, to-day, the construction of additional mortar platforms‡ in the fifth parallel. Made a position on the left of the second parallel for the calcium light to be used against Wagner.

* See Plate III. and Note 16. † See Plate III. ‡ See Note 11.

The One Hundredth New York Volunteers, Colonel Dandy commanding, Eighty-fifth Pennsylvania Volunteers, Lieutenant-Colonel Purviance recently commanding, and Third New Hampshire Volunteers, Captain Randlett commanding, comprising the three regiments of volunteer infantry detailed on the 19th ult. as the guard of the advanced trenches, were to-day relieved from this responsible and hazardous duty. Their aggregate number of casualities in this brief period is one hundred and five, or ten per cent. of the whole force.* Four-fifths of these were caused by the enemy's artillery fire. Captain Randlett was conspicuously efficient. The engineers will long remember these regiments as their special guard during the most critical part of the siege; also for their assistance in the sap, at which work a detail was constantly employed.

Friday, September 4.—Captain Walker reports, "During my tour of duty this morning, the sap was run twenty-five feet, when the enemy opened upon us a very heavy fire of artillery, compelling us to stop the advance and strengthen that which had already been built. The parapet proved able to withstand the fire, but it was pretty well knocked out of shape."

Emplacements were prepared on the right of the third parallel for two 10-inch siege mortars, which were soon afterward mounted there. Magazine material for 10-inch mortars was brought to the fifth parallel. Other work in progress as yesterday.

Saturday, September 5.—This morning the long expected, and by the sappers, anxiously hoped for, bombardment of Wagner, by all the land batteries and the Ironsides began, and with it ended all the difficulties in sapping against the work, for the enemy's fire, sharpshooters and all, is completely subdued and his distant batteries dare not fire at our advance for fear of injuring their friends in the fort.

* See Note 18. † See Plate III.

In the past two and one-half days, at considerable sacrifice, not more than twenty-five yards of sap* have been executed, and it, from its direction, brought us no nearer the fort. To-day more than one hundred and fifty yards, most of it by the flying sap, have been built without loss of life. The head of the sap is now opposite the ditch of Wagner; from it fragments of shell can be easily thrown by hand into the work.

The trace of the approach executed to-day is a succession of short zig-zagsmade necessary by the narrow front. Captain Walker was in charge of this work.

Magazine for the 10-inch mortars, in the fifth parallel, is completed and in use. Fascines were carried forward for use in the seaward parapet in advance of the fifth parallel.

During the past two days, by order of the general commanding, I have examined several prisoners, and have from them obtained additional information, which enabled me to draw a plan of Wagner, which was afterward found to contain no material error. At the request of General Terry twenty copies were furnished for the officers who were to go in the assaulting column of the 7th inst.

Sunday, September 6.—I reported for duty last night, and was assigned this morning to my original work on the right, by order of the general commanding.

The sap is progressing to-day. One branch is to pass to the left and the other to the right of the bastion of the fort, thus enveloping it.

To-day, as yesterday, men are constantly exposing themselves above the parapets without drawing any fire from the enemy. Indeed, in the extreme front, there is no danger except from our own fire. Fragments of our own shell fly back to our trench, in one case inflicting a severe wound. The fort is as silent as a natural sandbank, which, indeed, it much resembles. All the outside revetments of the work, its lines and surfaces, are destroyed by

* See Note 13.

our fire. It looms over the head of the sap a huge, shapeless sand bluff.

The firing of the Ironsides is excellent. A United States flag is kept constantly at the head of the sap, that she may direct her fire so as not to endanger us. Her shell strike the sea face of the work just in advance of the flag, ricochet over the parapet, fall, explode very regularly, and search every part of the work that can possibly be reached by a mortar fire.

Standing between the fires, and within a few yards of the point of striking, the opportunity to observe the effect, in the sand, of these huge shells from the smooth-bore guns of the navy and the rifles of the army was perfect. The ricochet of the former was uniform, and landed nearly every one in the fort. That of the latter was irregular, most of them exploded when they struck, throwing up a great quantity of sand, which falls back in its place, hence inflicting no injury save what may come from the heavy jar.

The right branch of the sap has, for some time, passed the zone of torpedoes;* none were found between the sea face and beach, but the plungers of a number can be seen in front of the south face of the work on our left.

In compliance with official instructions, the trenches have been widened and cleaned out, the reversed side and parapets sloped and formed into steps, and in every way fitted to hold the greatest number of troops, and to have the egress the easiest possible, preparatory to the assault which is ordered to take place at low tide to-morrow morning. This work, which was continued into the night, was in charge of Lieutenants Farrand and Adams.

Lieutenant McGuire had charge of the sap a portion of the day. He reports, "One sapper of the engineers was killed and three infantry wounded by the explosion of a torpedo."

The whole of the superior and the upper portion of the

* See Plate III. and Note 5.

exterior slopes of the south face of Wagner were plainly seen this night from the effect of the calcium light stationed at the left of the second parallel. The enemy's sharp-shooters fire scattering shots, which is unusual for the night-time. They also fired one mortar shell. Our sharp-shooters replied with occasional shots, and our mortars fired on the fort regularly but slowly.

The sap was this night in charge of Captain Walker, assisted by Captain Pratt. The former reports: "During this night a branch of the sap was run to the ditch of the fort, striking it at the salient angle. The right branch was run parallel with the sea face of the fort, and nearly to the ditch of the sea flank in that direction. About ten o'clock I passed over into the ditch of the fort, and examined it from the flanking guns on the sea flank to the flanking guns on the south front, for the purpose of giving accurate information to our storming party. I found on the sea face of the fort a formidable obstruction, in the shape of a fraise of sharp-pointed stakes,* firmly planted in the counterscarp of the ditch, and presenting their points about two feet below the crest. Between the stakes a spear, or boarding-pike, was placed, evidently with the intention of impaling our men upon their points. These spears I pulled out and laid in the bottom of the ditch, to the number, I should say, of two hundred. I then run a flying sap along the crest of the glacis, throwing the earth level with the points of the fraise, thus providing means for the storming party to pass over them."

Before the above-described operations were completed, a deserter came inside our lines and reported "Fort Wagner evacuated," the evacuation having commenced before midnight. Possession was taken of it and of the whole island, including Battery Gregg, before daylight of September 7th.

In this bombardment, which lasted forty-two hours, four

* See Plate III. and sections of Fort Wagner.

distinct lines of batteries were used, each firing over those in advance of it. Mortars were fired from the fifth, third, and first parallels, and heavy rifled guns from the second parallel and left batteries. The practicability of this method of using guns, into which we were forced by our narrow front, was demonstrated.

Some valuable lives were lost from the effect of our own shell, which exploded prematurely, but no such demoralizing and damaging effect on the troops in the advance was experienced as had been anticipated by some.

Monday, September 7.—The following injuries inflicted on Fort Wagner by the artillery fire of the past two days were observed this morning:

Of the sixteen pieces of ordnance in position which constituted the armament of the fort when it was taken, and in which there had probably been no change during the bombardment, only three were wholly disabled and unserviceable. This, after forty hours' bombardment, at short range, by an army and navy supplied with the best heavy guns in our service, manned by experienced artillerists, and during which the army alone threw over three thousand projectiles at the work. Only a part of these were directed at the guns of the fort.

The most serious injury to the material of Fort Wagner was inflicted on the most southerly of the sea-face traverses, in which was situated a bomb-proof shelter. A timber forming the south upper corner of the sheathing of this bomb-proof shelter was struck by a shot from the land batteries and considerably splintered. To reach this timber, at least ten feet of sand had been penetrated or removed by successive shots. It should be remarked that this bomb-proof shelter, as originally constructed, was open at its south end, forming, with the similar passage-ways through the other traverses, a free straight communication between the bomb-proof shelter and the sea face of the work throughout their length.

This passage way was probably closed up after our lodgment on Morris Island, by the traverse which we found at its south end, to protect it from an enfilading fire; hence may not have been as well built as the rest of the fort.

Considerable earth, which covered the south end of the main bomb-proof shelter, and the magazine just east of it, was removed by our fire. About seven feet was left, however, which was enough to make both structures secure against a much longer continued fire.

The other injuries to the work may be briefly enumerated thus: The regularity of all the lines and surfaces of the exposed parts was more or less destroyed, the superior slope of the south face being least injured. The banquette tread and breast height revetting of the north and west faces, which were taken in reverse by our fire, were so completely destroyed that these parapets afforded no advantages over a natural sand bank, for musketry defence. The communication between the sea face and bomb-proof shelter was partially filled with sand, in some places being three feet deep, but it was quite passable. The wooden banquette tread and steps leading to it, which extended along the south face of the work, was more than half destroyed by our mortar shells. The palmetto logs, which formed the revetting of the embrasures in the south front of the work, were considerably damaged, and would have required repairs before being used.

The following instructions, given by Colonel Turner, Chief of Artillery, to the battery commanders, are interesting, in connection with the above record of injuries inflicted by these batteries on Fort Wagner: 1. The siege mortars were ordered to distribute their fire over the whole work, exploding their shells just before striking. 2. The 30-pounder Parrott rifles were ordered to destroy the shelters built for sharpshooters, on the south face of the work. 3. The heavy guns were to direct most of their fire on the south end of the bomb-proof shelter, with the intention of

breaching it below its superior sheeting, and thus to enfilade its interior with our shot. A portion of the fire of the heavy rifled guns was also directed at the enemy's embrasure guns.

The effect of the navy fire was the same as the siege mortars.

Engineering improvements were commenced this morning in Fort Wagner, and the removal of torpedoes continued, under the superintendence of Lieutenant Wilcken, who, assisted by Corporals Beiter and Weimer, Company D, New York Volunteer Engineers, has disarmed, in all, twenty-six of these destructive arrangements.

I was this day relieved from active engineering duties in the field, by order of the general commanding.

NOTES

TO MAJOR BROOKS'S JOURNAL.

NOTE No. I.

INCLINED PALISADING—*Figures* 1, 2, 3 *and* 4.

THIS form of obstacle was chiefly depended upon as material obstruction in front of both defensive lines on Morris Island, *i. e.*, the first and second parallels. Altogether about four hundred and sixty yards were set. It was chiefly made at the engineers' depot, of fine saplings, from four to seven inches in diameter, which had been got out for bridge material.

The panel form, which was found to be a great convenience in transporting and setting the inclined palisading, most of which had to be done under fire, was suggested by the general commanding.

From the above and subsequent experience is deduced the following: Each panel should contain four or five poles, according to the size of the stuff used, care being taken to leave no opening through which a man's body could be forced. Round poles make better palisading than split ones. If the former are used, they should be not less than four nor more than six inches in diameter at the large end. If split, they should be not less than five nor more than eight inches in diameter at the large end, and should in no case be split more than once. Two-inch plank may be used for cleats, thereby making less work than split stuff.

Where standing pine saplings are tolerably abundant,

a detachment of twenty-four skillful men will work to the best advantage in about the following proportions: For every four axe-men felling and splitting timber, twelve men are required to carry the stuff an average distance of two hundred yards to the rendezvous, four men to saw and sharpen it, and four men to make the panels and pile them up. This squad will make, if tasked, sixty per day, which equals two and a half per man employed. They require for this work five felling axes, two hammer hatchets, and a large cross-cut saw. One hundred and seventy-five to two hundred pounds of five or six-inch spikes will be used for every one hundred panels made.

Four men can handle a frame readily, even when the stuff is green and water-soaked. Six panels made a load for a four-horse team. Two hundred men carried one hundred panels three hundred yards, dug the trench and set them, in three hours. Seventy-five men carried forty panels one hundred yards, dug the trench and set them, in fifty minutes. Sixty men carried sixty panels fifty yards, dug the trench and set them, in one and a half hours.

When made of split stuff, the palisading was much stronger with the bark side placed up, or from the enemy.

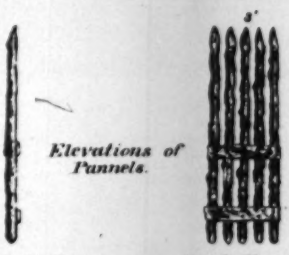
Toward the latter part of the siege, this obstacle showed considerable injury from the enemy's shot. Repairs were made by placing abatis in the openings thus formed.

NOTE No. II.

WIRE ENTANGLEMENT—*See* PLATE III.

This obstacle was made by placing stout stakes, three and a half feet long, two feet in the ground and seven feet apart, in quincunx order, and in three lines. Around the

INCLINED PALISADING.



Elevations of Pannels.

Fig. 1 Side. *Fig. 2 Front.*

Scales 10 feet to 1 inch.

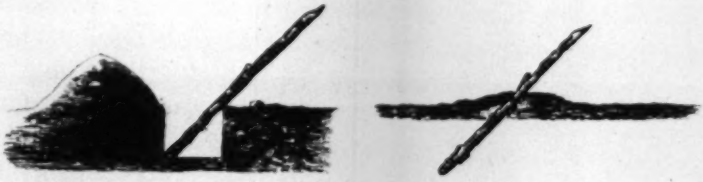


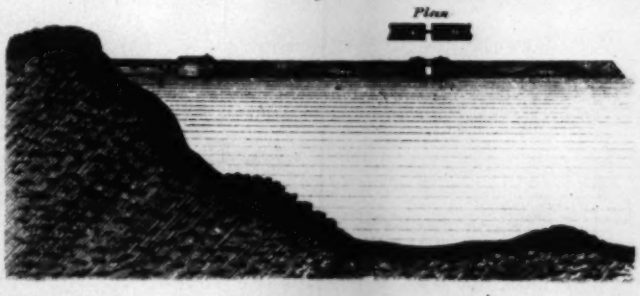
Fig. 3. Receiving Trench. *Fig. 4. Completed.*

BOOM.

(across Vincent's Creek.)

Scale 15 feet to 1 inch.

Fig. 5.



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top of these stakes, at from twelve to eighteen inches from the ground, in notches prepared to receive it, No. 12 wire was securely and tightly wound and extended from one to the other.

Each outside stake had five, and each centre one, four wires, from it. When this entanglement was placed in front of palisading, wires were crossed from it to the stakes, leaving no place for troops to form or work between the two.

This obstacle was rapidly built, and but little injured by the enemy's fire. From the fact that our own men, who knew of its existence, were often thrown down by it, I judge it would have proved efficient, had the enemy made an assault on our works. It is particularly well adapted to localities like this, where there is no timber at hand for other obstacle.

NOTE No. III.

Booms.—*Fig.* 5.

These were made of the captured twelve-inch squared timber found at the lumber yard. Enough pieces to reach across the creek were connected in the manner shown in the figure.

The ends of the boom were made fast in the bank by means of chains and kedge anchors, the anchors being buried in the earth and secured by pickets. Bars of iron spiked on the sides of these timbers would have increased the difficulty of cutting the boom. This precaution was not considered necessary in our defensive lines on account of the strong fire that could be brought on each boom.

NOTE No. IV.

The Seaward Defensive Barricade.

This structure, forming the right of the second parallel, extended across the beach from high to low water line. It is built of piles and cribbing, and has proved the most durable defensive field work, exposed to the action of waves, yet constructed in this department.

The crib work was of round timber from six to twelve inches in diameter, laid on the surface of the beach. The piles were seven inches in diameter, and were easily worked by hand into the quicksand three feet six inches, but it was almost impossible to force them any deeper by this method. Rope lashings were chiefly used for fastenings, as the noise of driving spikes was found to draw the enemy's fire.

The barricade consisted of thirty-four yards of musketry parapet, on each flank of which was a field gun battery. That on the right, at the extreme low water line, was called the surf battery, and was arranged for two field howitzers; that on the left, at high water line, was first occupied by three Requa batteries, and afterward by boat howitzers. The total length of the structure was fifty-seven yards.

A brief description of the surf battery will, in connection with the accompanying drawings, explain the whole. Its foundation was a strong crib thirty-two by thirty-six feet, built of heavy logs fastened together with ropes, on this was spiked a platform of heavy plank thirty feet front by twenty-five feet wide, its surface just above the highest tides. On the front of this platform was built a sand bag parapet eleven feet wide, six and a-half feet high and having a slope of 1 to 3 inside and 2 to 3 outside. At each flank of the battery was built a light sand bag epaulement, containing a recess $2 \times 2 \times 3$ feet for ammunition.

The surf battery was provided with three covered em-

SEAWARD DEFENSIVE BARRICADE AND SURF BATTERY.

Scale of Plan
40 feet to 1 inch.

Scale of Sections
24 feet to 1 inch.

Fig. 7. Section on A. B.

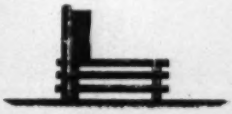

Fig. 8. Section on C. D.

Fig. 9. Section on E. F.

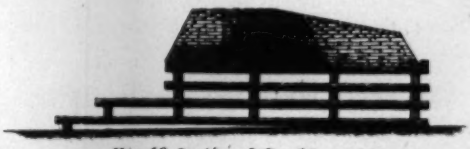

Fig. 10. Section & Profile on G. H.

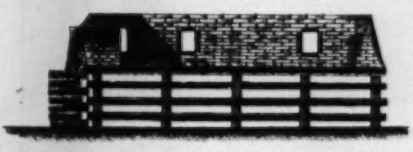

Fig. 11. Rear Elevation.

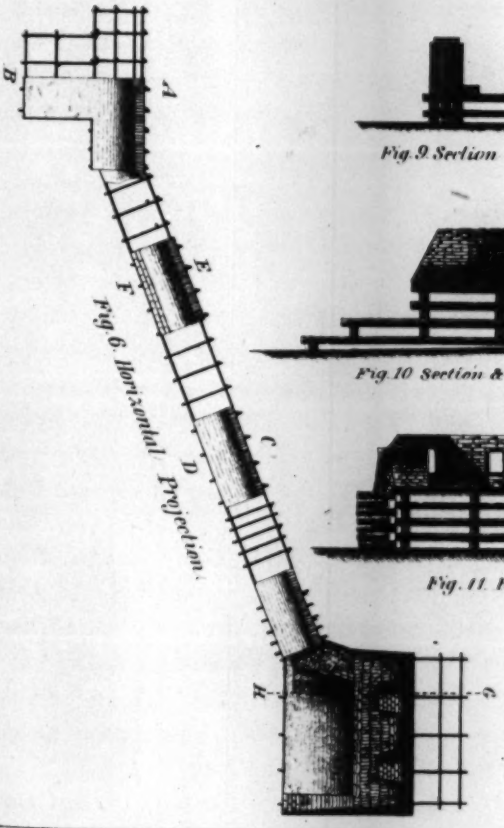

Fig. 6. Horizontal Projection.

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brasures lined with boiler iron, two for the left gun and one for the right. They were so arranged as to flank the second parallel and defend all the ground in its front to extreme low water.

NOTE No. V.

Torpedoes (enemy's.)

More than sixty torpedoes were found planted in the ground in front of Fort Wagner, arranged with an apparatus intended to be exploded by the tread of the men forming an assaulting column. They must have been placed subsequent to the 18th of July. This obstacle extended along the whole south front of the work, from the marsh to the beach. The torpedoes were most numerous in the narrow front next the beach, over which the mass of an assaulting column would have to pass. The first ones discovered (August 26) were two hundred yards from the salient of the port.

Three forms were found. The first, of which there were only about twenty, consisted of a loaded 24-pounder shell. In its fuse-hole was firmly fixed a wooden plug having a small hole through it. Extending into the powder of the shell through this hole was a fuse enlarged at its upper end into a ball containing the explosive composition which rested on the plug. Over all, enveloping the shell, was a cylindrical box of thin tin, painted black. The bottom of this box rested on the cap. This arrangement thus completed was buried fuse-hole up, the explosive composition being even with the surface of the ground, a slight pressure, as a foot fall, on the bottom of the box would explode the shell.

The second form was made of ten gallon kegs, the ends

of which were extended by conical additions, giving the whole the form shown in figures 12 and 13.

This peculiar shape, being the same possessed by several floating torpedoes, renders it probable that those planted in front of Fort Wagner were originally intended to be used against our shipping.

Figures 12, 13, 14, 15, 16 and 17 represent the torpedo and its explosive apparatus. *a a* are cast iron flanges suited to the curvature of the outside of the keg and carrying the collars *b*. These flanges are fastened to the wooden staves by bolts and nuts as represented. The collars *b* are tapped ten threads to the inch to receive a hollow plug *c*, into which is slipped the plunger *d*, having a projection or swell at its base *e*, and confined in the bore of the plug to prevent its falling through. Screwed into the lower part of the plug is the nipple *f*, surmounted by a circular piece of wood *g*. Through the nipple and wood is inserted the paper tube *h* containing the explosive material.

Water is excluded from around the plunger by the stuffing box nut *i*, and from the junction of the plug *c*, and the collar *b*, by the leather washer *k*.

The small hole in the plunger is intended for the insertion of a spike or wire to keep its base from contact with the fulminate until set in the ground.

l is a rectangular piece of board, its ends resting on the ground and plunger to increase the chances of explosion. In place of this board a cap forming three arms of iron shown in figures 16 and 17, was in a few instances substituted; stepping on one of the arms would have the same effect as on the board.

The wooden torpedoes were easily rendered harmless by pouring water into the powder through a small auger hole bored for that purpose. Over thirty were removed in this way.

The third form, of which but three were found, consisted of one large 15-inch navy shell, buried like the small shell

TORPEDO (enemy's).

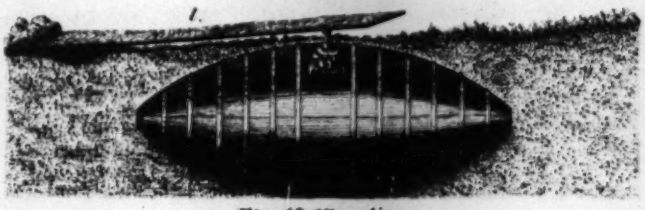

Fig. 12 Elevation.

Scale $\frac{1}{10}$ of full size.

Fig. 13 Section.

Explosive Arrangement.

Scale $\frac{1}{4}$ of full size.

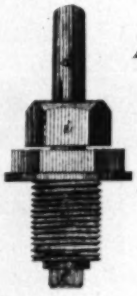

Fig. 14 Elevation.

Fig. 15 Section.

Arrangement,
sometimes substituted for board 1, Fig. 12.

Fig. 16. Plan.

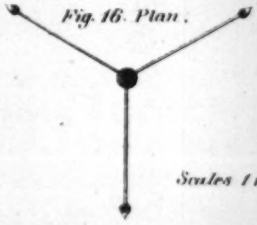

Fig 17 Section.

Scales 1 inch to 20 inches

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first above mentioned, but having the metallic explosive apparatus like the wooden ones above described.

At least six torpedoes exploded accidentally, producing about twelve casualties.

NOTE No. VI.

Observations concerning the Location, Organization and Administration of an Engineer Depot or Park, from Experience in these Siege Operations.

1. An engineer depot in the field should be located on or at the termination of the main line of communication of the army with its base of supplies, and should be provided with such storehouses or tents, shops, wharves, &c., as are necessary. If not within an extended line of fortifications, special works should be erected for its defence, in which case the depot detachment would form a part or the whole of the garrison of these works.

2. The duties belonging to an engineer depot are to obtain by requisition, manufacture, or capture, engineer tools, machines and materials; to preserve, repair and issue the same, for use in engineering operations. It is related to these operations as the ordnance depot is to those of the artillery.

3. It should be under the control of the chief engineer, and subject only to his orders and those of the general commanding.

The commander of the engineer depot and his assistants should be engineer officers. For service at the depot should be a permanent detail of artificers and laborers, a portion, if not all, being engineer soldiers.

4. Stores for the engineer depot are obtained by requisition on the chief engineer of the United States Army at Washington, D. C. These requisitions are made by the

depot commander, and approved by the department chief engineer.

At the engineer depot, or under its control at other more suitable points, the manufacture of such siege material as fascines, gabions, sap-rollers, obstacle and shelter material, should be constantly in progress.

Sufficient stores should be kept constantly on hand to meet the probable exigencies of the service.

In those emergencies in which the quartermaster's department have to turn over to the engineer depot, or the reverse, tools or material, the papers accompanying the transfer should indicate plainly the use to which such stores are to be applied, in order that the accounts of these two departments may be adjusted at Washington.

The engineer depot commander should have funds and power to purchase such stores as he cannot obtain of the kind required, or with sufficient promptness, from other sources.

5. The books and files of the engineer depot should constantly show the amount of stores on hand and their condition; the localities and rates at which the different kinds of engineer material are being prepared and expended; the accessible localities at which engineer material can be obtained; the amount of stores issued to each assistant or superintending engineer officer, and the purposes for which they have been used; the amount and condition of the engineer stores at each of the service or branch depots.

Such additional books as are required by paragraph 1,373, Revised United States Army Regulations, must be kept.

6. The requisitions of assistant or superintending engineer officers on the depot commander for stores, should express definitely the numbers, quantity, dimensions, time and place to be delivered, and use, and are filled on the approval of the chief engineer.

7. The depot commander should expend all the engineer stores used, lost or destroyed on the works, which are issued from his depot, and make proper returns for the same.

8. A certain amount of transportation, as teams and boats, should be under such control of the depot commander, that he can obtain it at any moment, night or day. Ordinarily, the transportation of engineer stores issued from the depot will be under the control of its commander.

9. In different parts of the works, branch or service depots should be established, at which the tools and material of a certain portion of the field of active operations are collected when not in use, and inventoried, and where, to a limited extent, repairs and manufacturing may be done. Service depots should be in charge of details from the permanent detachment serving at the depot. The chiefs of these small depots should report daily to the depot commander, and to the engineer officer in charge of the works in which their depots are located, the amount and condition of the stores on hand. At least one cart for gathering and distributing tools and material should be stationed at each branch depot.

Such depots were established during the siege in the second and fifth parallels, and proved exceedingly useful.

10. In the operations before Sebastopol, "nine special applications of steam power, to facilitate the operations of the siege," were made by the English army. But for the use of this cheap and unlimited power, immense fatigue details must have been made from the ranks to have done the work; in consequence, the English army would have been proportionately paralyzed, and unable to perform those military operations which can only be done by men.

In the siege operations herein described, steamers were used for transportation from the base of supplies. Steam saw mills at Hilton Head, seventy miles distant by sea,

furnished, after great delay, a part of the lumber used. A steam hoisting apparatus was in use at the wharf at Hilton Head for unloading vessels, and a steam floating derrick, the "Dirrigo," in Lighthouse Inlet, for the same purpose, both of which proved very useful. It may also be noted here, that a steam pile-driver was used in the construction of the wharf at Hilton Head, early in 1862; and steam condensing machines have been used, to a considerable extent, for making fresh from salt water.

At least one portable steam saw mill should belong to an engineer depot, supplying material for a siege.

NOTE No. VII.

List of the various kinds of Instruments, Tools, Materials, and Machines furnished from the Engineer Depot, and employed in the Siege Operations against the Defences of Charleston Harbor, 1863.

I.—Instruments and Stationery.

Instruments.

Compass, prismatic,
Drawing instruments,
Field glass,
Sextant, pocket,
Tape lines,
Telescope.

Stationery.

Drawing paper,
India ink,
Note-books,
Ordinary Stationery,
Tracing cloth,
Water-colors.

II.—Tools.

Carpenters'.

Sets of Axes, broad,
" " felling,
" Axe-helves,
" Adzes and handles,
" Chalk,
" Chalk lines,
" Hammers,
" Hammer hatchets,
Sets of Plumb-bobs,
" Rules,
" Saws, "hand,"
" " "cross-cut,"
" " "pit,"
" Spirit levels,
" Squares.

Blacksmiths'.

Sets of Anvils,
" Bellows,
" Drills, "hand,"
Sets of Drills, "ratchet,"
" Forge, "portable,"
" Sledges.

Masons' and Bricklayers'.

Sets of.

Tinners'.

Sets of.

Caulkers'.

Sets of.

Sailmakers'.

Sets of.

Sappers'.

Sapping Implements.

Wheelwrights'.

Sets of.

Miscellaneous.

Crowbars,
Files, assorted, kinds and sizes,
Gabion knives,
Grindstones,
Handles, assorted,
Hatchets,
Jack-screws,
Kettles, tar,
Lanterns,
Pickaxes and handles,
Shovels,
Spades,
Spirit levels,
Tape lines,
Top mauls and handles,
Vices, coachmakers',
" blacksmiths',
" carpenters',
" screws and nuts for,
Wheelbarrows.

III.—MATERIALS.

Siege Materials.

Abatis material,
Fascines,
Gabions, iron and wood,
Hides, raw,
Inclined palisading, panels,
Sap rollers,
Sandbags, gunny cloth,
Stakes or pickets.

Ironmongery.

Anchors,
Bolts, screws,
" ring,
" eye,
" key, and keys,
Hinges, iron strap,
" butt,
Iron, bar,
" rod,
" hoop,
" plate,
" sheet,
" angle,
Lead, sheet,
Locks,
" padlocks, with extra keys,
Mauls, iron,
Nails, cut,
" wrought,
Rivets, iron,
Sandpaper,
Chains, iron,
Copper, sheet,
Emery paper,
Grapnels,
Hasps, iron,
Screws, wood,
Staples, iron,
Spikes, wrought,
" cut,
Soft solder,
Steel bar, square,
" octagonal,
" round,
" flat,
Tacks, iron,
" copper,
Tin, sheet,
Wire, iron,
" copper,
" steel,

Timber, Plank, &c.

Hemlock,
Oak, white,
" red,
" live,
Pine, white,
" yellow,
} Boards, plank, scantling, joists and timbers.

Cloth, Ropes, &c.

Canvas, cotton,
Cordage, hemp, plain,
" " tarred,
" Manilla, plain,
Cordage, cotton chalk lines,
Cotton, in bale,
Marline,
Twine, sailmakers', cotton.

Paints, Oils, &c.

Benzine,
Chrome Yellow,
Lampblack,
Lead, red,
" white,
Oil, linseed, raw,
Oil, linseed, boiled,
" whale,
Pitch,
Spirits of Turpentine,
Tar.

IV.—Auxiliary Machines.

Floating steam derrick and steam hoisting apparatus for unloading vessels,
Steam sawmills,
" pile drivers,
" and hand pumps,

V.—Miscellaneous Articles.

Buckets, water, wooden,
" " tin,
Casks, empty,
Coal, blacksmiths',
" anthracite,
Fuze, Gomez's,
Gutta-percha, in mass,
" in sheets,
India-rubber packing,
Measures, dry and wet, sets of,
Oars,
Oil-cans,
" squirts,
Oakum,
Paddles,
Scales, weighing,
Tackle blocks.

NOTE No. VIII.

Statement of the Quantities of the most important Items of Engineer Material, expended in the Siege Works herein described, according to Accounts kept at the Engineer Depot.

QUANTITY.	ARTICLES.	REMARKS.
46175	Sand bags.	For seaward barricade, &c.
12	Coils of rope.	
1762	Feet of loose rope.	
400	Fathoms of tar marline.	
4510	Feet of timber joist.	For magazines and platforms, splinter-proof shelters, &c.
12382	Feet of boards and planks.	
17	Feet of wiring frames.	Not used.
50	Iron gabions.	For embrasures.
1117	Wattle gabions.	Less than half this number used.
7	Sap rollers.	Filled with fascines.
3	Sap rollers.	Filled with cotton.
26	Fascines (18 feet.)	
45	Loads of abatis material.	
200	Pickets (4 feet.)	
15	Bundles of stakes.	For fastening hides.
86	Pounds of nails.	
890	Pounds of spikes.	
14	Dozen screws.	
13	Coils of wire.	For entanglement.
890	Feet of loose wire.	For entanglement.
11	Bars of iron.	
94	Feet of chain.	For booms, not used.
14	Iron plates.	For embrasure linings.
44	Raw hides.	For embrasure linings.
4	Empty casks	In service magazine.

NOTE No. IX.

PREPARATION OR MANUFACTURE OF SIEGE MATERIAL.

I.—WOODEN gabions, fascines, sap fagots and sap rollers.

From August 11th to September 9th, a detail of twenty-five engineers and seventy-five infantry made, on Folly Island, 1,429 gabions, three feet long and two feet in diameter; 11 sap roller gabions, four feet in diameter and from seven to nine feet long; 162 fascines, nine inches in diameter and twelve, sixteen and seventeen feet long; 302 sap fagots, nine inches in diameter and three feet long. Not more than two-thirds of the gabions were expended in the siege.

The detachment above mentioned were subdivided as follows:

A gabion party consisted of two engineers and four infantry, who made, as a stint, seven gabions per day.

A fascine party consisted of three engineers and nine infantry, who made twelve fascines eighteen feet long, or sixteen of the shorter lengths, or twenty-four sap fagots, per day.

A sap roller party consisted of two engineers and eight infantry, who made two sap roller gabions, four feet in diameter and seven or nine feet long, in three days.

Each squad got out its own material, which was tolerably convenient.

The engineers only were instructed in the duty.

Twenty-eight gabions, or from eight to twelve fascines, made a load for a four-horse team.

II.—Iron gabions or sap rollers.

For each iron gabion there are required forty-four pounds of hoop iron, .058 inch thick, and No. 17 wire guage; thirty iron rivets, flat-headed, eighteen inches in

diameter, and No. 7 wire guage; 8.5 square feet of boards; five hours' labor of one skilled man.

This estimate of the amount of labor required presupposes its application in the most advantageous manner, which was found to be as follows, the working party consisting of ten men:

Four carpenters to prepare the stakes.

Two smiths to make the hoops.

Four artificers to assemble the gabion.

The dimensions of the web are $6\frac{4}{16}$ feet long by three feet wide. The stakes project from the gabion three inches, making its total height $3\frac{4}{16}$ feet, its diameter being two feet. The average weight of iron gabions is sixty pounds. If the hoop iron be of uniform thickness, its width will not affect the quantity required. That used in the siege was from 1 to 1.5 inches wide.

The approximate cost of the material for an iron gabion, at present prices, (iron seven cents per pound and boards seven cents per foot,) is four dollars.

Material required for a sap roller nine feet long and four feet in diameter, made with an iron gabion and fascines, being the kind chiefly used in the approaches against Fort Wagner:

Two hundred and seventy-nine pounds of hoop iron, .058 inch thick, No. 17 wire guage.

One hundred and thirty iron rivets, flat-headed, No. 7 wire guage.

Fourteen stakes, 3×1^1 inches, and nine feet long, weighing fourteen pounds each.

Twenty fascines, nine feet long and nine inches in diameter, weighing eighty-three pounds each.

And a sufficient number of wedges to fasten them.

Total approximate weight of sap roller, two thousand two hundred pounds.

NOTE No. X.

Sand Bags.

In the siege operations herein considered, filled sand bags have been used for the following purposes: Revetting parapets and embrasures, forming loop-holes for sharpshooters, filling gabions, foundations for mortar platforms, coverings for splinter-proofs and magazines, making banquette treads and traverses. The bags have also been used for transporting sand and shell by hand.

It is hard to conceive how this siege could have been conducted without sand bags. Forty-six thousand one hundred and seventy-five, according to the account kept at the engineer depot, have been expended on the portion of the work herein described.

In the construction of the batteries against Fort Pulaski, which were also built of sand, but few sand bags were used. Only a small portion of that work, however, was executed under fire.

The material of the bags here used was a good quality of gunny cloth, although rather light for some of the purposes for which the bags were used. They were sewn with cotton twine. The first lot furnished had the chain stitch; the later ones the lock stitch. The latter is far the best. Each bag contains $\frac{33}{100}$ of a square yard of cloth, and, when finished, weighs 6¼ ounces.

The dimensions of the filled sand bags, when laid, varied from $6 \times 10 \times 24$ inches to $5\frac{1}{2} \times 11 \times 23$ inches, and contained $\frac{3}{10}$ of a cubic foot of damp sand, weighing about 85 pounds; hence 32 to the cubic yard.

The bags were always laid as headers and stretchers, and usually in the English or Flemish bond.

Our experience proves that sand bags which are tied before being laid should not be more than three-fourths filled. If full, they do not lay as well, and are more liable

to burst on becoming wet or under great pressure. It is more rapid, but less economical, not to tie the bags at all, but give the throat a twist, and turn it under the end of the bag as each is laid.

Sand bag revetting requires less anchoring to make it stand than any other. Of the revetting herein described, only that of the heavy guns was anchored by means of wires and pickets. (See section *a a*, Plate III. *bis*.) Scarcely any of the portions not anchored failed for want of it. In the siege of Fort Pulaski, much of the hurdle and fascine revetting gave out because not properly anchored. If the sand bag revetting of a battery which is being fought is kept wet, the sand will not so readily escape through the rents in the bags, nor will the bags burn. But this dampness hastens their decay.

At the end of two months, the sand bags used in revetting the siege works herein described began to show signs of decay; but with careful usage, under favorable circumstances, sand bags might not require replacing in twice the above time.

Abrasion, the result of serving guns, and from other causes, made holes in the bags, which allowed the dry sand to escape, thus destroying the revetting. When the interior space would admit, sand bag revetting which had thus failed was repaired by facing it with a sod wall.

NOTE No. XI.

MORTAR PLATFORMS.—*Figures* 18 *and* 19.

THE siege mortar platforms of Battery O'Rorke and Weed used in the first bombardment of Fort Wagner, and those of Battery Totten, used in the bombardment of

Fort Pulaski, April 10th and 11th, 1862, all shewed evidences of failing, and required important repairs after a few hours firing. These platforms were made of the deck plank, 9 feet long × 5 inches × 3½ inches, furnished by the United States Ordnance Department, and were put down in conformity with the rules for laying these platforms, given in "Heavy Artillery Tactics," pages 91 and 92, modified slightly by circumstances uncontrollable in field operations.

I sought a mortar platform for direct firing, which should be more durable than those above noted, and such that there could be used in its construction the heavy squared timber and plank captured on Morris Island. The simple one shown in figure 18, was made and put down for the 10-inch siege mortars in Battery Weed, and a similar one for the 8-inch mortar in Battery Reynolds July 21st, the only difference being in the width from centre to centre of the rails; in the 10-inch it is twenty-eight inches, in the 8-inch twenty-two inches. The material was yellow pine. The two-inch plank forming the foundation were thoroughly spiked fast to the rails. The platform is bedded with the vertical plank to the rear, and buried so that the upper surface of the rails is level with the terreplain of the battery. No pickets were used to stay it.

These platforms were used throughout the siege with very slight repairs. Those for the 8-inch mortars were moved with the pieces from the first to the third, thence to the fifth parallel. More than five hundred rounds were fired from each at ranges of from two hundred to one thousand three hundred yards.

Figure 19 represents the platforms laid for the 10-inch sea-coast mortars of the battery at the Beacon House, never used. If the decking in this last plan had been extended over the whole platform, a mortar could be fired in any direction from it. In a similar manner, *i. e.*, by

means of a decking, the rail siege platforms above described could be prepared for general firing.

The following rules relating to the construction and use of mortar platforms embody many of the facts observed in the siege of Fort Pulaski and Wagner, the supporting earth being a fine quartz sand.

1. It is indispensable that the parts comprising the platforms be thoroughly fastened together by means of joints and spikes or screw bolts, the latter should be used for very long ranges.

2. The plan of the platform may be varied somewhat to suit the material at hand, the amount, range and direction of the fire. Large constituent pieces are best. For siege mortars, a platform containing twenty cubic feet of lumber, and having a bearing on the ground of thirty-six square feet, is safe for average circumstances. Thirty cubic feet and fifty-four square feet would be correspondingly safe for sea-coast mortars. For direct firing the platforms should be longest in the direction of the line of fire.

3. Pickets driven about platforms will not prevent them from being forced to the rear by long continued firing.

4. The greater the weight of the mortar in proportion to the weight of the shell, the less the injury to the platforms; hence the new pattern mortars are least destructive.

5. The service of the mortar by the artillerist has much to do with the wear of platforms.

NOTE No. XII.

IRON EMBRASURE LININGS.—*Figures* 20, 21 *and* 22.

GABIONS, fascines and hurdle work, when revetting the cheeks of embrasures, were found to leak the fine dry sand used in the construction of our works, unless filled or

backed with sand bags. This remedy adds to the expense and labor, and is besides not very durable. Sods suitable for revetting are scarce on this coast.

Sand bags alone lasted a long time in Battery Hays, but its guns were fired at elevations of 5° and upward. These high elevations gave a far less injurious cone of blast than low ones. The raw hides used for lining sand bag embrasures were soon blown out (particularly by the Wiard gun) in spite of our efforts to make them fast by means of notched pickets.

To overcome these difficulties a boiler or sheet iron casing or lining was made from iron plates obtained from the wreck of an iron ship (a blockade runner) which came ashore at Light House Inlet. The splay, the dimensions of the throat, size of cheeks, length and inclination of sole, thickness of plates used, were varied to suit the case. For direct firing the splay may be 25°, or even less.

To set the casing the sole of the embrasure is first given its proper slope. On this sole is placed the iron casing, its directrix having the proper direction. Sand bag merlons were built on each side, to which the lining was anchored by means of wires and crooked iron rods which were made fast to its cheeks and rings.

The plates used for the embrasure casing of gun No. 1, Battery Rosecrans (a 100-pounder Parrott rifle fired at Sumter with an elevation of 9° 35′) were one-fourth of an inch thick and weighed ten and four-tenths pounds per square foot, corresponding with No. 3 Birmingham ring gauge. This was the heaviest iron employed. Of the eight embrasure casings in the second parallel, the above mentioned was the only one used against Sumter, and the only one supplied with a mantlet. This mantlet is of bullet-proof iron plate, arranged as a hanging door, which closes the throat of the embrasure. In this door is a cut or slot for the double purpose of allowing the rammer and sponge staves to pass through when loading, and for

sighting the piece. A small scantling of hard wood, with a rope attached to its upper end, is made fast on one side of the door, and acts as a lever to raise the door when the gun is fired. The swing bar of one inch round iron, upon which the hinges of the door are hung, has a collar at each end to resist lateral pressure. The sole was given a counter slope of 5°. The wings prevent the casing from being carried out by the force of the blast.

The cheeks are fastened to the soles and the wings to the cheeks by being riveted to angle iron.

The satisfactory results obtained from the use of these casings, indicates that sheet and boiler iron, should form part of the siege material furnished for military operations in a sandy country. If thick enough it answers well for mantlets. All plates of this kind are easily converted into Sibley stoves for the use of an army in winter quarters.

NOTE No. XIII.

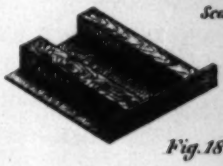
Sapping.

Seventeen hundred and twenty-five yards of approach, including parallels and boyaux, were executed in advance of the obstacle of the second parallel, all of which may be considered as having been employed exclusively against Fort Wagner. Of this, about twelve hundred and fifty yards, or three-fourths of the whole, was by the flying sap; in only seventy-five yards of which were gabions used. Over six hundred yards was arranged for musketry defence; the banquette slope only, however, being revetted.

The full sap proper was not employed. About one hundred and eighty yards were executed by the full sap without revetting, and three hundred yards by the half full sap, mostly without revetting. The full sap without ga-

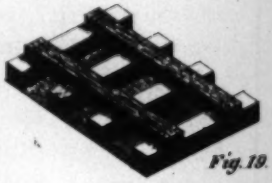
MORTAR PLATFORMS.

Scale 10 feet to 1 inch.



Bill of Material used.
2 Timbers 6 1/2 long 12" by 12"
7 Plank 6 1/2 long 12" by 2"
70 6 inch Spikes.

Fig. 18 Siege Mortar Platform.



4 Timbers 6 1/2 long 12" by 12"
6 Plank 9' long 12" by 2"
6 Deckplank 3 1/2" by 5" or
2 Timbers 9' long 5" by 10 1/2"
16. 10" and 10 1/2 6" spikes.

Fig. 19. 10 inch sea coast mortar Platform.

IRON EMBRASURE LINING.

Scale 4 feet to 1 inch.

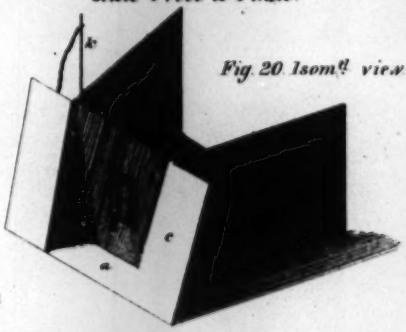


Fig. 20 Isom.c view.

Fig. 21 Front Elevation.

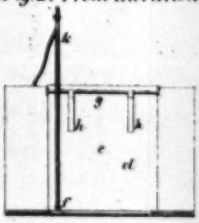
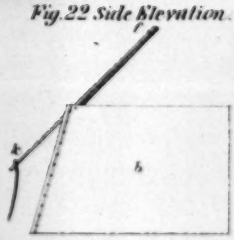


Fig. 22 Side Elevation.



Reference.

a. Sole
b. Cheeks
c. Wings
d. Hanging door
e. Seat for rammerstaff.
f. Eyebolt for insertion of rammer.
g. h. Rings of door.
i. Angle iron.
k. Lever for opening door.

D. Van Nostrand, Publisher.

J. Bien, Lith. 24 Vesey St. NY.

bions was advanced at the rate of six or eight feet per hour under the fire of sharpshooters and distant artillery. The artillery fire of Fort Wagner, when directed on the sap, greatly delayed, and on several occasions stopped, its progress.

A full sapping brigade consisted of eight artificers and two non-commissioned officers of volunteer engineers, divided into two squads, who alternated on duty at the head of the sap. All assisted in moving the sap roller, which weighed about a ton.

The roller was moved forward a few inches at a time, the interval being closed up to it quickly by filling the gap with sand. The trench was dug four feet wide and two feet deep, with no berm.

The tools employed were one common short-handled shovel for each sapper, two sap-hooks, two strong levers, twelve feet long. Axes were used for removing roots and timber.

For forming the top of the parapet a drag-shovel, made by bending the blade of a common long-handled shovel at right angles, was used.

NOTE No. XV.—(*Extract.*)*

Penetration of Rifled Musket Balls (Sharp, Enfield, and Spencer) into various kinds of Siege Material, as ascertained by Practice on Morris Island.

In dry Yellow Pine, . .	penetrated	from	$2\frac{3}{4}$	to	$3\frac{1}{4}$	inches.
" green Palmetto, . .	"	"	$7\frac{1}{2}$	"	$8\frac{1}{2}$	"
" a dry Fascine, . . .	"	"	$8\frac{1}{2}$	"	$9\frac{1}{2}$	"
" dry sand contained in bags,	"	"	6	"	7	"
" wet " " "	"	"	$7\frac{1}{2}$	"	$8\frac{1}{2}$	"
" loose damp Sand, . .	"	"	8	"	14	"
" Cotton packed in sandbags by hand,	"	"			22	"

* Note No. XIV. omitted.

NOTE No. XVI.—(*Extract.*)

* * * * * * *

From these reports I extract the following description: This rifle battery is a device for multiplying and accelerating infantry fire from rifle barrels, and appears in principle to be a substitute for a six-pounder field gun whenever grape and canister are needed, and, to the extent of its range, case shot, over each of which it possesses greater precision and much less liability to fail in producing desirable results.

It consists of twenty-five rifle barrels, each twenty-four inches long, arranged upon a horizontal plane and held in position upon a light field carriage by an iron frame. Upon this frame, in the rear of the barrels, is fitted a sliding bar, worked by two levers, (one at each side,) by which the cartridges are forced to the rear of the chambers. By a lever under the frame the barrels may be diverged so as to scatter the balls one hundred and twenty yards in a distance of one thousand. The weight of the battery, complete, is thirteen hundred and eighty-two pounds.

When served by three men, the battery is readily fired seven volleys, or one hundred and seventy-five shots, per minute. It did not foul. Nine degrees elevation gave a range of twelve hundred yards, at which distance, the barrels being diverged, the shot scattered into an effective line. Thirteen hundred yards is probably its effective range, although two thousand yards is claimed for it. The axis of the barrels is thirty inches above the plane on which the piece stands.

During the siege, four emplacements were constructed for the "Requa rifle batteries" in the first parallel, five in the second, two in the third, five in the fourth, two in the fifth, and one in advance of it, in all, nineteen positions, built successively as the approaches advanced; all these positions were occupied for a longer or shorter time by these

batteries. They were located on the flanks or in the salient angles of the works. About one-third were in embrasure. The platforms used were of boards eight feet square, well nailed to five sills of same material. They were moved forward with the pieces. These batteries constituted, up to the 23d of August, the only artillery in advance of the second parallel; at that date three coehorn mortars were moved forward into the fourth parallel.

On several occasions these batteries were used against the enemy's sharpshooters and working parties, apparently with good effect. On the evening of August 25th the two batteries in the fourth parallel took an active part in a brisk skirmish. Three infantrymen, who were not thoroughly drilled, served each piece. They were fired rapidly, and apparently with good effect.

Being breech-loading, and easily handled, scarcely any exposure above the parapet was required on the part of the gunners. But one piece was disabled during the siege, and it was quickly repaired.

Although the defensive properties of the Requa rifle battery were not severely tested in the small amount of service above recorded, I feel quite satisfied that it is adapted to the defence of earthworks, particularly in a flat country like this, where the horizontal line of dispersion afforded by the fire of this piece is more effective than the cone of dispersion of the howitzer. It should be noted that the angle of dispersion can be varied to suit the case in this battery, which is not true of the howitzer.

These properties, together with its small recoil, and its loading at the breech, and lightness, are the qualities most desirable in a gun for boat service.

NOTE No. XVII.

Recommends the adoption of sling-carts, with broad tires, for sand and mud roads.

NOTE No. XVIII.

WORKING PARTIES, AND HEALTH OF TROOPS.

THE total number of days' work, of six hours each, expended in Major Brooks's operations was, by engineers 4,500, and by infantry 19,000, total 23,500; of the 19,000 days' work by infantry, one-half was performed by colored troops. In addition to the above, 9,500 days' work were expended in preparing siege materials for Major Brooks's operations. The infantry soldiers' day's work is about one-fifth what a citizen laborer would do on civil works. Of my work, over eight-twentieths was against Wagner, about seven-twentieths on the defensive lines, and nearly five-twentieths on batteries against Sumter.

The approximate amount of labor actually expended on the more important works is as follows:

One emplacement for a siege piece, ...	40 days.
" " " heavy breaching gun, . .	100 "
" bomb-proof magazine, ...	250 "
Construction and repairs of each yard of approach having splinter-proof parapet, ...	2 "
A lineal yard of narrow splinter-proof shelter, . .	4 "
" " " wide " " . . .	8 "
To make and set one yard of inclined palisading, .	2 "

At least three-fourths of the manual labor was simply shoveling sand; one-half the remainder was carrying engineer material. The balance was employed in various kinds of work.

About three-fourths of this work was executed in the night-time, and at least nine-tenths of it under a fire of artillery or sharpshooters, or both. The sharpshooters seldom fired during the night. The artillery fire was most severe during the day. Thirty-five projectiles fired by the enemy at our works per hour was called "heavy firing,"

although sometimes more than double that number were thrown.

In the order of their number the projectiles were from smooth-bore guns, mortars, and rifled guns.

The James Island batteries were from two thousand to four thousand yards from our works; Fort Sumter and Battery Gregg were respectively about three thousand five hundred and two thousand one hundred; Fort Wagner was from thirteen hundred to one hundred yards.

The total number of casualties in the working parties and the guard of the advanced trenches, (not including the main guard of the trenches,) during the siege, was about one hundred and fifty. When it is considered that on an average over two hundred men were constantly engaged in these duties, being under fire for fifty days, the number of casualties is astonishingly small.

The camp at which the fatigue parties were quartered and fed were, in order to be beyond the reach of the enemy's fires, two miles from the centre of the works; hence the distance of four miles had to be marched each tour of duty, which required nearly two hours, and added greatly to the labor of the siege.

This siege has been conducted through the hottest part of the season—July, August, and September—yet the troops have suffered but little from excess in heat, on account of the large proportion of night work, and the almost constant sea-breeze, which was always cool and refreshing.

The amount of sickness was great, the large amount of duty being the probable cause. On the 7th of August the percentage was the smallest observed during the siege, being 18.6. At this date the aggregate garrison of Morris Island was 9,353, of which 1,741 were sick. On the 17th of August 22.9 per cent. of the whole garrison were on the sick list. This was the most unhealthy period of the siege.

The average strength of the command on Morris Island during the siege was, of all arms, 10,678 men, of which the average per centage sick was 19.88. The number of black troops varied from 1,127 to 1,947.

Average percentage of sick in Artillery, ...	6.2
" " " " Engineers, ...	11.9
" " " " Black Infantry, . . .	13.9
" " " " White " (excluding one brigade,)	20.1

This brigade consisted of the Ninety-seventh Pennsylvania, Twenty-fourth Massachusetts and Tenth Connecticut Volunteers. It averaged thirty-two per cent. sick This was due to the fact that these three regiments had been stationed, before moving to Morris Island, on Seabrook Island, which proved very unhealthy. The engineers and black infantry were employed exclusively on fatigue duty. The white infantry served as guard of the trenches, as well as for work in the same.

Details from the troops on Folly Island took part in the operations on Morris Island.

It was found by experience that men under these circumstances could not work more than one-fourth the time. A greater amount at once increased the sick list. Eight hours in thirty-two, or eight hours on and twenty-four off, was found to be the best arrangement, as it made a daily change in the hours of duty for those regiments permanently detailed for work.

The organization found most advantageous in working a command permanently detailed for fatigue duty, was to divide its effective force into four equal detachments, on duty eight hours each, relieving each other at 4 A. M., 12 M. and 8 P. M. The large number of extra troops employed in the trenches each night were usually changed daily.

The engineer officers in charge of the works were divided

into corresponding groups, four in each, relieving each other at 8 A. M., 4 P. M. and 12 midnight, four hours different from the time of relieving the troops. This difference enabled the engineer officer to carry the work through the period of relieving the fatigue details.

One engineer officer, having from two to four different kinds or jobs of work to superintend, was found to work advantageously in the night, with the help of non-commissioned officers of engineers, from one hundred to two hundred men.

The working parties of engineers and black infantry seldom carried their arms into the trenches, while the white infantry fatigue parties usually did.

NOTE No. XIV.

Colored Troops for Work.

CIRCULAR.

Headquarters Department of the South,
Engineer's Office, Morris Island, S. C.,
September 10th, 1863.

As the important experiment which will test the fitness of the American negro for the duties of a soldier is now being tried, it is desirable that facts bearing on the question be carefully observed and recorded.

It is probable that in no military operations of the war have negro troops done so large a proportion, and so important and hazardous, fatigue duty, as in the siege operations on this island.

As you have directed the operations of working parties of both white and black troops here, I respectfully ask, for the object above stated, an impartial and carefully prepared answer to the following inquiries, together with

such statements as you choose to make bearing on this question.

I. Courage, as indicated by their behavior under fire.

II. Skill and appreciation of their duties, referring to the quality of the work performed.

III. Industry and perseverance, with reference to the quantity of the work performed.

IV. If a certain work were to be accomplished in the least possible time, *i. e.*, when enthusiasm and direct personal interest is necessary to attain the end, would whites or blacks answer best?

V. What is the difference, considering the above points, between colored troops recruited from the free States and those from the slave States?

Very respectfully, your obedient servant,

T. B. BROOKS,

Major, Aid-de-Camp and Asst. Engineer.

Six replies to these inquiries were received from engineer officers who had been engaged in the siege, the substance of which is embraced in the following summary.

Following the summary, two of the replies are given in full.

1. To the first question all answer that the black is more timorous than the white, but is in a corresponding degree more docile and obedient, hence more completely under the control of his commander, and much more influenced by his example.

2. All agree that the black is less skillful than the white soldier, but still enough so for most kinds of siege work.

3. The statements unanimously agree that the black will do a greater amount of work than the white soldier, because he labors more constantly.

4. The whites are decidedly superior in enthusiasm. The blacks cannot be easily hurried in their work, no matter what the emergency.

5. All agree that the colored troops recruited from free States are superior to those recruited from slave States.

It may with propriety be repeated here, that the average per centage of sick among the negro troops during the siege was 13.9, while that of the white infantry was 20.1 per cent. (See Note 18, above.)

The per centage of tours of duty performed by the blacks, as compared with the white infantry, was as 56 to 41. But the grand guard duty, which was considered much more wearing than fatigue, was all done by the whites.

The efficiency and health of a battalion depends so much upon its officers, that, in order to institute a fair comparison, when so small a number of troops are considered, this element should be eliminated. This has not, however, been attempted in this paper.

MORRIS ISLAND, S. C.,
September 11th, 1863.

MAJOR,—In answer to your several queries as per circular of September 10, 1863, requesting my opinion as to the relative merits of white and black troops, for work in the trenches, I have the honor to make the following replies:

I. "Their courage as indicated by their behavior under fire."

I will say, in my opinion, their courage is rather of the passive than the active kind. They will stay, endure, resist and follow, but they have not the restless aggressive spirit. I do not believe they will desert their officers in trying moments, in so great numbers as the whites; they have not the will, audacity or fertility of excuse of the straggling white, and at the same time they have not the heroic nervous energy, or vivid perception of the white, who stands firm or presses forward.

I do not remember a single instance, in my labors in the trenches, where the black man has skulked away from his

duty, and I know that instances of that kind have occurred among the whites; still I think that the superior energy and intelligence of those remaining, considering that the whites were the lesser number by the greater desertion, would more than compensate.

II. "Skill and appreciation of their duties referring to the quality of the work done."

They have a fair share of both, enough to make them very useful and efficient, but they have not apparently that superior intelligence and skill that may be found largely among the non-commissioned officers and privates of the white regiments.

III. "Industry and perseverance with reference to the quantity of the work done."

I think they will do more than the whites; they do not have so many complaints and excuses, but stick to their work patiently, doggedly, obediently, and accomplish a great deal, though I have never known them to work with any marked spirit or energy. I should liken the white man to the horse (often untractable and balky) the black man to the ox.

IV. "If a certain work were to be accomplished in the least possible time, *i. e.*, when enthusiasm and direct personal interest is necessary to attain the end, would whites or blacks answer best?"

I cannot make up my mind that it is impossible to arouse the enthusiasm of the blacks, for I have seen enough of them to know that they are very emotional creatures; still though they might have more dash than I have seen and think possible, it is unquestionable to my mind that were the enthusiasm and personal interest of both aroused, the white would far surpass the black.

It seems to me that there is a hard nervous organization at the bottom of the character of the white, and a soft susceptible one at the bottom of the character of the black.

V. "What is the difference, considering the above points,

between colored troops recruited from the free States, and those from the slave States?"

I should say that the free State men were the best; they have more of the self-reliance, and approximate nearer to the qualities of the white man in respect to dash and energy, than those from the slave States.

Summary.—To me they compare favorably with the whites; they are easily handled, true and obedient; there is less viciousness among them; they are more patient; they have great constancy. The character of the white, as you know, runs to extremes; one has bull-dog courage, another is a pitiful cur; one is excessively vicious, another pure and noble. The phases of the character of the white touches the stars and descends to the lowest depths. The black character occupies the inner circle. Their status is mediocrity, and this uniformity and mediocrity, for military fatigue duty, I think answers best.

I am respectfully, your obedient servant,

JOSEPH WALKER,
Captain New York Volunteer Engineers.

Major T. B. BROOKS,
Aid-de-Camp and Assist. Eng. Depart. of the South.

MORRIS ISLAND, September 16, 1863.

Major T. B. BROOKS, *Assistant Engineer, Department of the South.*

SIR,—I have the honor to state that I have received from you a circular of inquiry respecting the comparative merits of white and black soldiers for fatigue duty, requesting my opinion as derived from observation and actual intercourse with them, on several specified points, which I subjoin with the respective answers.

I. "Courage as indicated by conduct under fire."

I have found that black troops manifest more timidity under fire than white troops, but they are at the same time more obedient to orders, and more under the control of

their officers, in dangerous situations, than white soldiers.

II. "Skill and appreciation of their duties with reference to the quality of the work performed."

White soldiers are more intelligent and experienced, and of course more skillful than black ones, but they have not generally a corresponding appreciation of their duties. As a consequence I have in most cases found the work as well done by black as by white soldiers.

III. "Industry and perseverance with reference to the amount of work performed."

White soldiers work with more energy while they do work than black ones, but do not work as constantly. Black soldiers seldom intermit their labors, except by orders or permission. The result, as far as my observation extends, is, that a greater amount of work is usually accomplished with black than with white soldiers.

IV. "If a certain work were to be accomplished in the least possible time, when enthusiasm and direct personal interest is necessary to the attainment of the end, would whites or blacks answer best?"

Whites. Because, though requiring more effort to control, they possess a greater energy of character and susceptibility of enthusiasm than the black race, which can be called into action by an emergency or by a sufficient effort on the part of their officers.

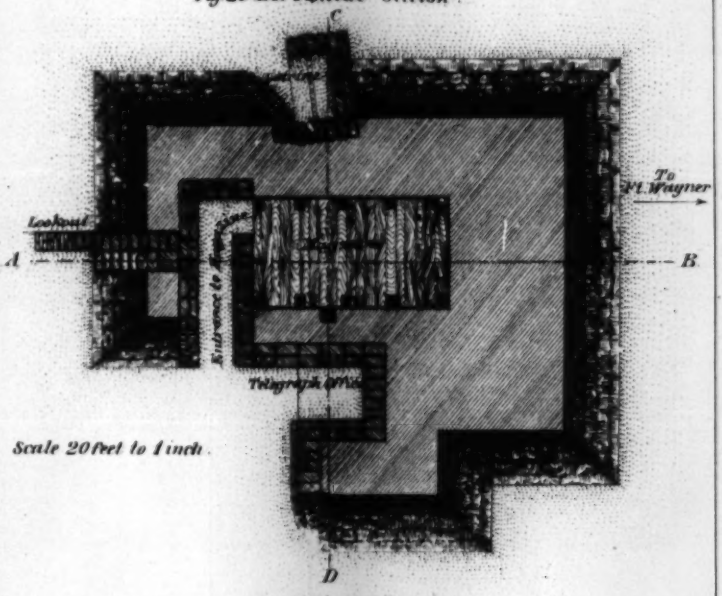
V. "What is the difference, considering the above points, between colored troops recruited from the free States and those from the slave States?"

I have observed a decided difference in favor of those recruited from the free States.

The problem involved in the foregoing investigation is more difficult of a solution than appears at first sight, owing to the fact that the degree of efficiency peculiar to any company of troops depends so much on the character of their officers, an element that must eliminate from the

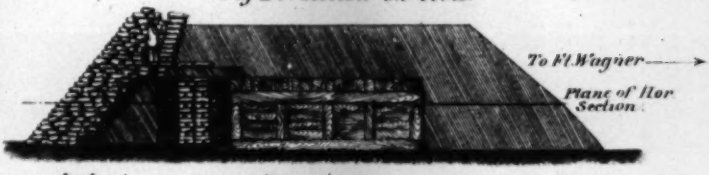
MAIN MAGAZINE, TELEGRAPH OFFICE, LOOKOUT AND LATRINE IN SECOND PARALLEL.

Fig 23 Horizontal Section.



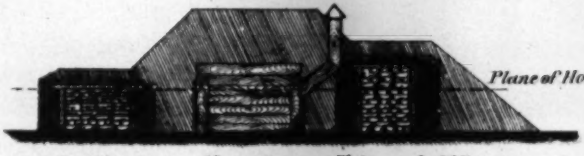
Scale 20 feet to 1 inch.

Fig 24. Section on A. B.



Scales 20 feet to 1 inch.

Fig 25 Section on C. D.



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SPLINTER PROOF SHELTERS.

Used in Approaches.

Scale 10 feet to 1 inch.

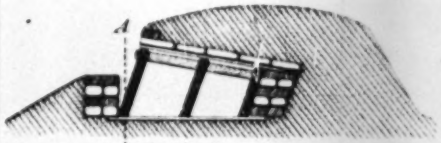

Fig. 26 Section. WIDE. *First Form used.*

Fig. 27 Elevation. on A.B.

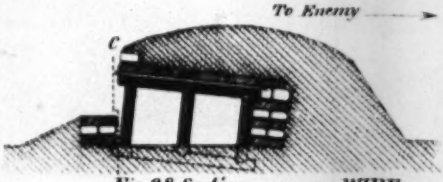

Fig. 28 Section. WIDE. *Second Form used.*

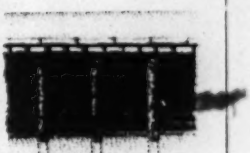

Fig. 29 Elevation. on C.D.

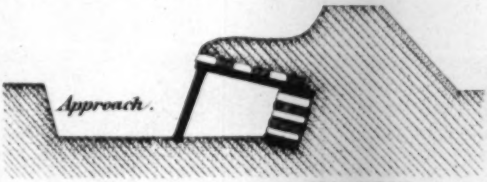

Fig. 30 Section. NARROW

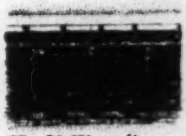

Fig. 31 Elevation.

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question in order to ascertain the quality of the material of which the troops are composed.

I have the honor to be your obedient servant,

H. FARRAND,

1st Lieut. New York Volunteer Engineers.

NOTE No. XX.

THE MAIN MAGAZINE, TELEGRAPH OFFICE, LOOK-OUT AND LATRINE IN THE SECOND PARALLEL. —*Figures* 23, 24 *and* 25.

THESE structures, built together for economy of space and material, are shown in plan and section, by Figures 23, 24 and 25. The magazine frame was of heavy timbers, sheeted with plank. Sand bags were used for revetting throughout.

NOTE No. XXI.

SPLINTER-PROOF SHELTERS.

Figures 26, 27, 28, 29, 30, and 31, shelters for guards of trenches and garrisons of batteries.

Transverse frames, Figures 28, and 29, same as longitudinal frames for narrow shelters, Figures 30 and 31.

Three hundred and ten lineal yards of shelter (wide and narrow) protected about one thousand men.

The surgery in second parallel was 32 feet × 10 feet × 5½ feet high, covered with seven feet of sand.

APPENDIX C.

REPORT OF COLONEL SERRELL.

HEADQUARTERS DEPARTMENT OF THE SOUTH,
ENGINEER OFFICE, MORRIS ISLAND, S. C.,
September 10th, 1863.

GENERAL AND CHIEF ENGINEER,—

1. GENERAL,—I have the honor, in obedience to your orders, to submit herewith a report of the engineering operations, and the preparations therefor, which have been executed under my immediate directions, as one of the assistant engineers of this department, during this campaign, independently of the works constructed and duties performed by my regiment.

2. *Hilton Head, July* 1.—This afternoon drilled two boats' crews in Scull Creek, with the saws for cutting off piles under water. Saws work well. These saws are represented in Plate B, and are elsewhere described and referred to.

3. Received orders to get material ready, and ship same, for a bridge five hundred yards long, similar to the model bridge at the volunteer engineer camp at Hilton Head.

4. This bridge is represented in Plate A. Fig. 1 is a general elevation; Fig. 2, plan; Fig. 3, a cross section; Fig. 4, the method of securing the floor beams to the uprights; Fig. 5, an enlarged figure, showing the method of holding the floor boards *a* in place; *b* is a strip, one and a half inches by five inches, which is lashed over the floor planks; Fig. 6 repressnts the shoe used at the bottom of

Plate A.

Fig. 1.

Fig. 3.

Scale for Figs 1, 2 & 3.

10 9 8 7 6 5 4 3 2 1 0 10 feet

Scale for Figs 4, 5 & 6

0 1 2 3 4 5 feet

Fig. 2.

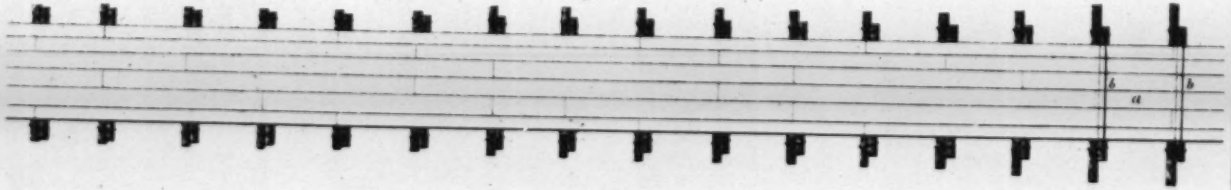

Fig. 6.

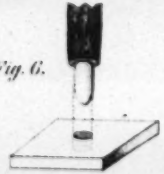

Fig. 4.

Fig. 5.

Fig. 4.

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the trestle, to prevent it sinking too deeply into a muddy bottom; *c* is the knot used in the lashing.

5. *July* 2.—Got ready the suspension bridge, leaving this matter particularly in charge of Lieutenant Hiram Farrand, Volunteer Engineers. The span of the bridge is two hundred feet. New towers of timber work have to be made, which were planned, and instructions left with Major Butt to have Lieutenant Farrand make them as soon as possible, and ship the bridge with the trestle bridge and engineer tools.

6. *July* 3.—Continued building the trestle bridge day and night, with a detail of seventy-five engineers and one hundred and fifty infantry; Major Butt in charge.

7. Had a large party of engineers repairing the ponton train No. 7.

8. *July* 4.—Getting the bridges and pontons ready, and repairing all the boats and scows that can be found.

9. *July* 5.—Same work as yesterday. Some delay for want of lumber.

10. *July* 6.—Fourteen hundred feet of the trestle bridge nearly ready to ship. Suspension bridge and boats progressing.

11. *July* 7.—Began to ship the bridges on the steamer "General Meigs." Some delay for want of timber. At work until midnight getting tools and materials shipped; then left with the commanding general, on board the "Mary Benton," for Folly Island, taking the saws for cutting piles under water, on this steamer, having given Major Butt, Volunteer Engineers, instructions to ship the remainder of the bridges and tools.

12. *July* 8.—Arrived in Folly River at 10 A. M.

13. Orders were received to remove so many of the piles in the Folly River, at the point indicated on the general maps, as would admit the passage of the largest launches and the large scows.

14. This was done the same night, by sawing them off

under water, at a depth of eight feet below low tide. Plate B shows the machinery used.

15. Fig. 1 represents a front view of the saw, and Fig. 2 shows a side elevation; Fig. 3, the general disposition in plan.

16. The saw is worked by boring a hole in the pile to be sawed off, at the proper height above water, and in this hole an iron pin is inserted, upon which the saw frame vibrates. Ropes, from the rings at either end of the saw, are taken to boats properly anchored, or held, as they were in this case, by sharp-pointed poles *b b* thrust into the sand at the bottom of the river. At a given signal, the ropes are pulled alternately, and the saw vibrated.

17. In this way a pile ten or twelve inches in diameter was cut off in an average length of time of from six to seven minutes; including the change from one pile to another, about ten minutes were occupied.

18. The piles were driven in two rows, alternating with one another, four feet apart in each row. The rows were three feet apart. Three piles had been taken out previously, or a space of about that extent was found in the channel way. An opening was cut twenty-two feet wide. During the time the work was being done, a six-oared, heavily manned rebel boat came down upon us, but did no damage.

19. So much importance seemed to be attached to the operation, that I superintended it in person, and took charge of the working of one saw. Lieutenant Charles B. Parsons, Volunteer Engineers, took charge of the other, and is entitled to credit for his efficiency.

20. The army did not pass here during the night, as was expected, but did the next night, to assault Morris Island.

21. During the time General Strong's column was passing, at daybreak, Lieutenant Parsons sawed off several more piles, increasing the width of the opening some nine or ten feet, under heavy fire of the enemy.

Fig. 1.

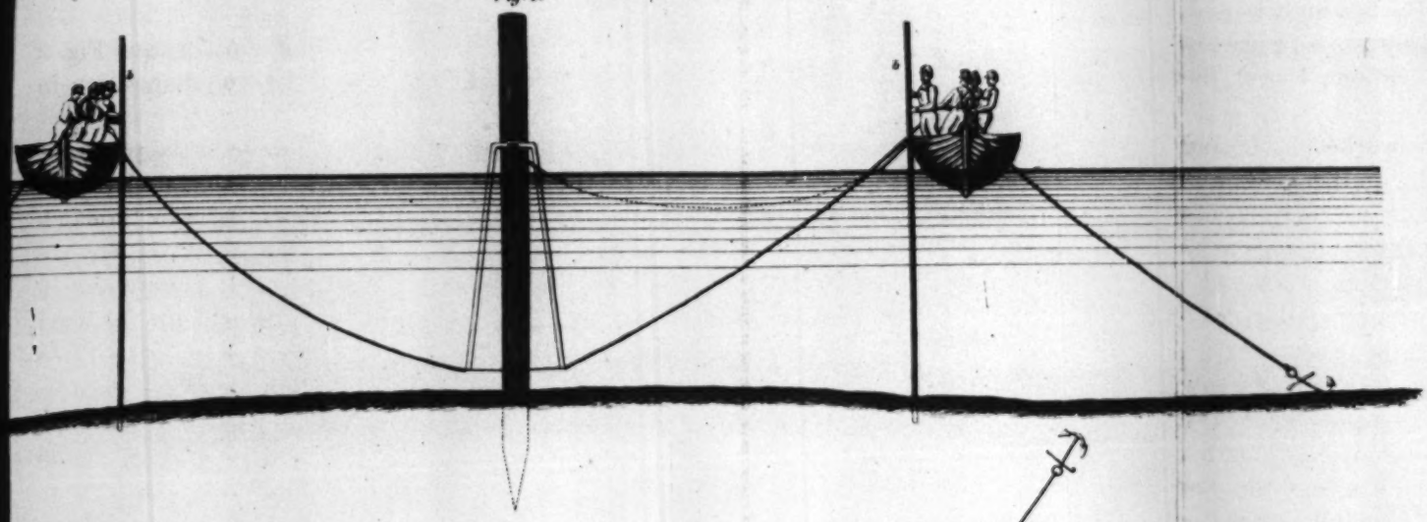


Fig. 2.

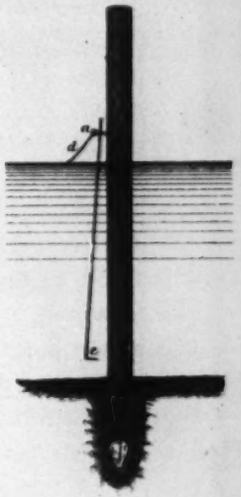
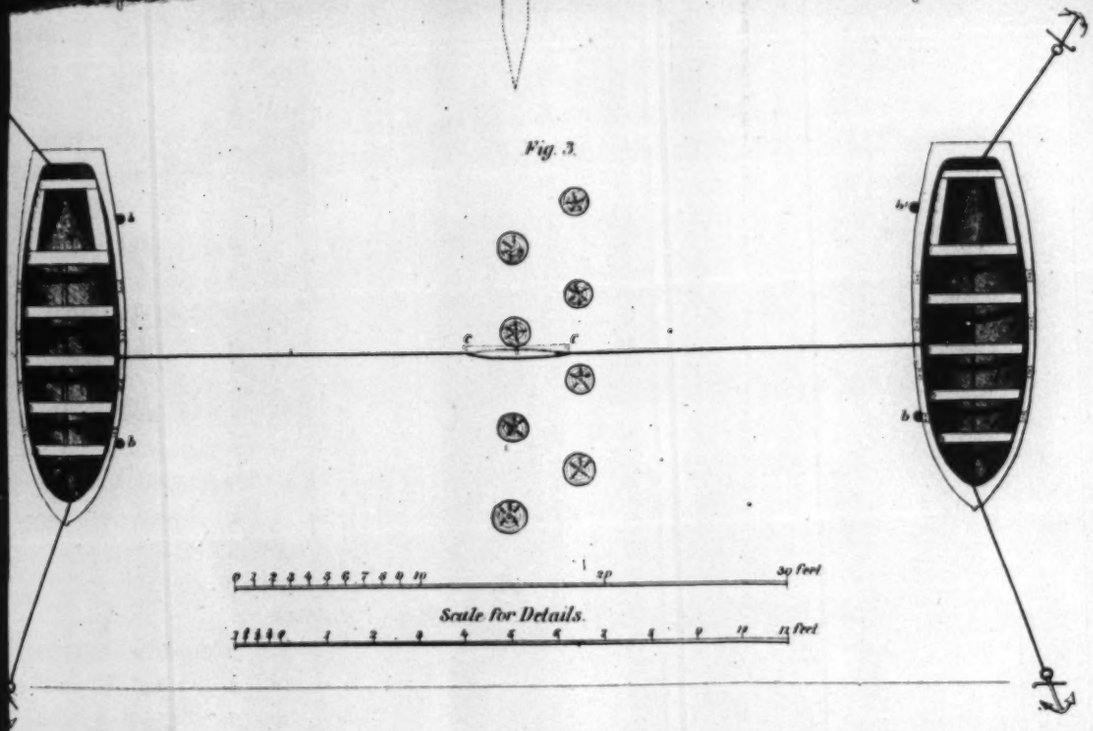
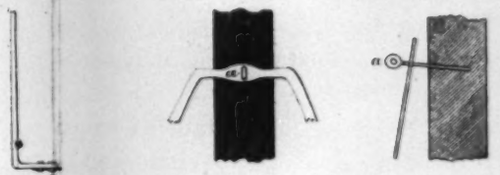


Fig. 3.





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22. As a very material improvement in the machinery used, I suggest that the arms to which the saws are fastened, *c c*, should be lengthened, so that the ends may project, say a foot beyond the teeth of the saw, that the saw can never be drawn out of its scarf.

23. The direction of the cut should be slightly oblique to the current, but the pressure of the water must be on the back of the saw. The pin *a*, on which the saw frame vibrates, should be set slightly inclined downwards into the pile, and the ropes should be pulled so as to bring the saw up to its work. Where this cannot be done, a third boat must be used, with a feeding line, which is simply a cord attached to either side of the saw frame, and the two ends brought together to pull the saw teeth against the log.

24. As the pile is cut off and falls over, the pin on which the saw is hung is pulled out with a lanyard, *d*, and the saw is hung upon the next pile, in which a hole has already been bored for the pin.

25. *July* 9, 4 A. M.—Learned that the attack was not to be made this morning, and prepared to land engineer material that had been brought up from Hilton Head, and in the evening visited the batteries at the north end of Folly Island, which were ready to open fire, and some others still in course of erection.

26. *July* 10.—The south end of Morris Island having been carried by our forces, established a flying scow ferry across Lighthouse Inlet, and took over the artillery and horses of the staff and quartermaster's department, and several regiments; the ferry being made with the scow brought through the opening in the piles in Folly River, and worked under the direction of Lieutenant Parsons.

27. During the night some work was begun, to secure our front against the enemy, but tools had not arrived, and but little was executed. They were merely rifle pits.

28. *July* 11.—Preparations made for beginning work in front, getting on shore materials and tools.

29. Began the erection of a bridge across Lighthouse Inlet, which had previously been prepared and shipped on a steamer which lay in Folly River, but, for want of transportation, little progress was made. The bridge was intended to extend across the Lighthouse Inlet, but for various reasons—the principal one being the difficulty in getting the material on the ground, and the fact that the flying scow ferry worked very well—after about eighty or ninety feet had been built and used as a boat landing, it was abandoned. This plan will not answer in hard bottoms, where the slope is considerable, or where the tide runs very fast.

30. *July* 12.—All day occupied getting materials forward. Received orders to begin a line of works against Fort Wagner; to put in six Wiard guns, four of Brayton's battery, six Parrott 10-pounders, and five Requa guns; and in the second line on the left prepare for ten Parrott 20 and 30-pounders, as soon as they could be obtained, and to intersperse with light mortars in the sand hills, in suitable positions.

31. Moved up the entire volunteer engineer force present, consisting of four hundred and twenty-eight men for duty, near the old rebel hospital in front.

32. Personally reconnoitered towards Fort Wagner, some three hundred yards beyond our advanced pickets, an hour before dark. At eight in the evening began the work afterwards converted into the first parallel of the siege, at a point indicated by Captain Brooks, Aid-de-Camp, as that selected by the commanding general, working three companies of engineers and two hundred men of Colonel Jackson's Third New Hampshire Volunteers, all night, under fire of the enemy.

33. Some other operations had been contemplated, but at 5 P. M. the following order was received:

HEADQUARTERS DEPARTMENT OF THE SOUTH,
July 12, 1863.

COLONEL,—The general directs that you confine your work to-night to the light rifle batteries immediately in front of Fort Wagner.

Very respectfully,
JOHN W. TURNER,
Colonel and Chief of Staff.

Colonel SERRELL,
Volunteer Engineers.

P. S.—This may modify your requirements for working parties.

34. *July* 13.—Began a pier with piles worked in by hand and a scow, at the north end of Folly Island. Frieze had been prepared at the suggestion of an officer of the staff, and ordered by the general to be used in the scarp of the batteries in the first parallel if practicable, which I made and had taken to the ground last night. They were not used, because, if so placed, a very large part would be cut away to open the embrasures; they were, therefore, set in advance of the batteries about one hundred and fifty yards.

35. The work was done under the direction of First Lieutenant R. F. Butt, Volunteer Engineers, and under a heavy fire. He deserves credit for the efficiency he displayed on this occasion.

36. *July* 14.—At 3 P. M., turned over the works in the batteries to Lieutenant Suter, United States Engineers, and ordered to give personal attention to the piers and means of crossing Lighthouse Inlet.

37. Wind blowing very hard, and great delay experienced for want of means to land materials. Worked all night, Captain J. L. Suess, Volunteer Engineers, assisting with a large working party.

38. *July* 15.—Sent for pile-driver, which on its way from

Stono was afterwards rendered useless, by certain parts being thrown overboard in a storm. Finished a pier at Folly Island to six feet deep at low water.

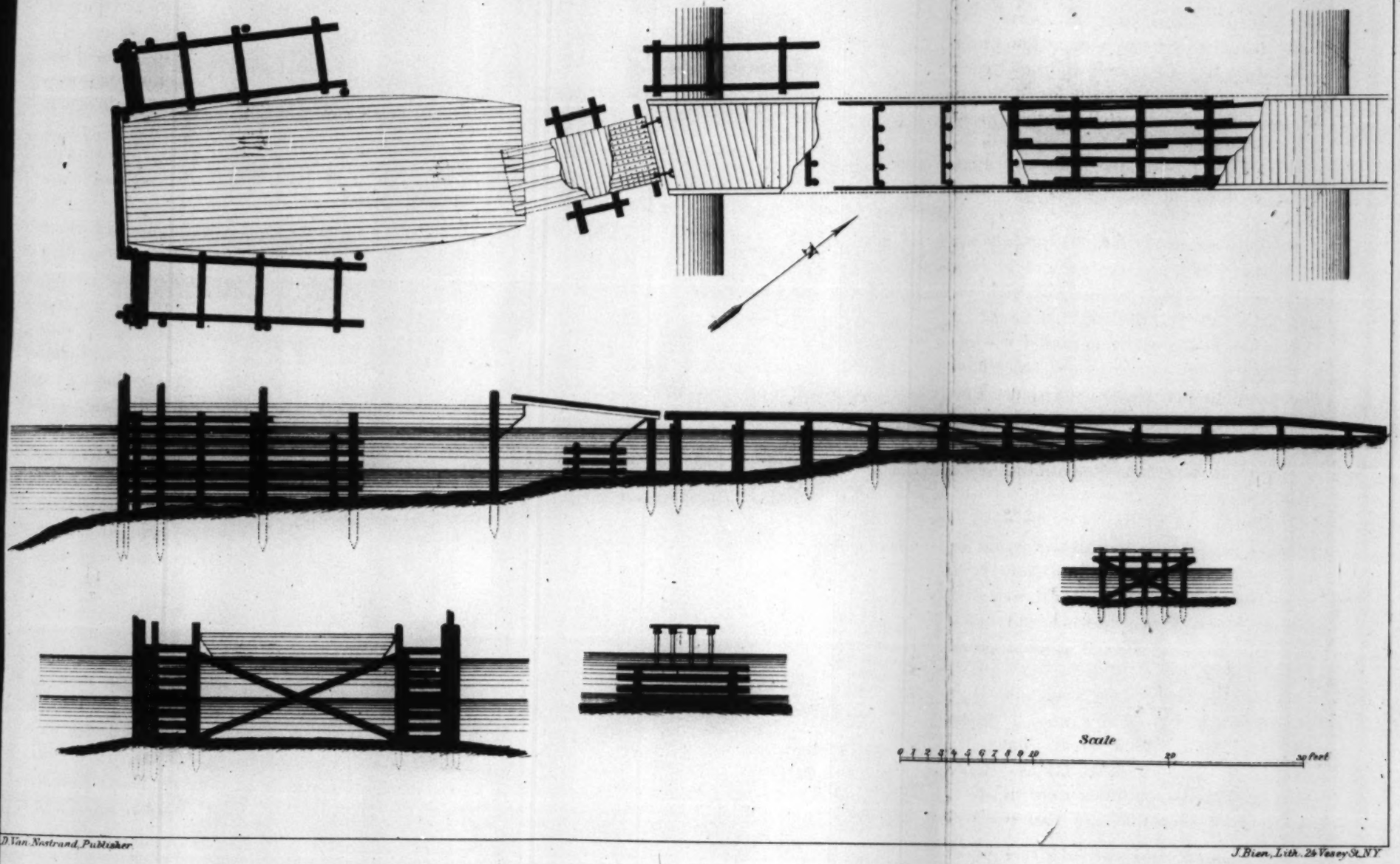
39. *July* 16.—Examined and reported on the state of the batteries, and selected a site for three breaching batteries on the left to be directed against Sumter. Staked out same in echelon, directed the establishment of a telegraph cable across Lighthouse Inlet, one that had previously been put down having been dragged up by a steamer's anchor.

40. Between the 17th and 19th July a large quantity of frieze was made, and the ground in front of our position examined personally for six hundred yards toward Wagner, with a view to the establishment of parallels or batteries. The next day triangulated the position of the enemy's works on James Island, and having, by order of General Gillmore, requested Captain Bacon, of the United States gunboat McDonough, to make a reconnoissance up the Lighthouse Inlet, went with him and succeeded in shelling out the rebels, dismounting one gun they had just put in position.

41. During the following two days the party making frieze were at work, and all the available strength and resources of the command that could be applied were kept at constantly improving the means of crossing the inlet from Folly to Morris Islands, and in making sap rollers, and one hundred and fifty more panels of frieze. The piers were by this time in a good condition to use them.*

42. On the 25th two batteries were begun in the first line of works, which was now known as the first parallel, in which to mount four naval guns. Heavy parties were worked at night, and, as far as practicable, during the day, until these batteries were finished. They occupied the centre of the line, and had two 200-pounder Parrott

* The temporary pier at south end of Morris Island is represented in Plate C, in plan, elevation, and sections.



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rifled guns, and two 80 pounder Whitworth guns mounted in them.

43. On the morning of the 27th a very thorough survey of Black Island and its situation, relative to the enemy's works on James Island, was made. During the next day a lookout was built at an advanced point, in the top of a very high pine tree, and a causeway across the marsh from the sand ridge on the left of Morris Island, near where the left centre batteries had been established, to Black Island, was begun, under the direction of Captain Eaton, Volunteer Engineers.

44. During the night of the 28th July an attempt was made to put in abatis across the beach from the right of the second parallel, beginning at low-water mark, but when some fifteen or twenty yards had been planted, the enemy came out on the beach in front of Wagner, and poured in such a heavy fire of grape and canister, from four field guns, that the party was very much annoyed, and several of the horses which had been used in bringing up the material having been either killed or wounded, the others took fright, although stationed three hundred yards to the rear of the work, and ran off with twenty-three wagons which had not yet been unloaded.

45. A number of attempts were made to continue the work, and the men behaved well, but before the materials could again be brought together and the work proceeded with, the tide had risen so much as to make it impracticable. Some good men were lost in this affair, and daylight, and the enemy's sharpshooters, terminated the effort. Captain Charles P. McKenna and Sergeant Mandeville, Volunteer Engineers, were very useful. Sergeant Mandeville was killed.

46. Experiments were now made for the purpose of continuing the investigations of the practicability of erecting batteries on the marsh.

THE MARSH BATTERY.

47. On the 16th July an order was received to see if a position could be found on the marsh, on our left front, where a battery could be constructed.

48. Taking Lieutenant N. M. Edwards, Volunteer Engineers, to assist, I proceeded at once on foot across the swamp to the creek which runs from near the junction of the plank road to Charleston harbor. The following is the report made on this reconnoissance:

49. HEADQUARTERS VOLUNTEER ENGINEERS,
MORRIS ISLAND, July 16, 1863.

MAJOR,—I have the honor to report, that agreeably to the orders of the general commanding the department, I made this morning, assisted by Lieutenant N. M. Edwards, Volunteer Engineers, a reconnoissance across the marsh, from the batteries on our left to the creek between this island and Lighthouse Creek, a distance of about half a mile, bearing, from the southwesterly end of the hard ground, a course by magnetic compass, north 40° west, to a point from which the bearing to Fort Sumter is north 12° east, and to the old beacon light south 89° east. At this point there is a spot of hard ground a few inches above or below high-water mark, irregularly, from twenty-five to thirty feet long, and fifteen to eighteen feet wide, the longer axis being perpendicular to the fire of Fort Sumter, or nearly so. Between this spot and the hard ground on which the batteries are now being built the marsh may be crossed by infantry at low tide, with some difficulty. About one-third of the distance will bear a man, sinking in one or two inches, another third six or eight inches, the other third somewhat deeper.

50. A battery to be constructed at this point must be entirely made of sandbags, with platforms grillaged.

51. I think a gun weighing not over ten thousand pounds can be drawn across the marsh on skids framed together to slip on the mud, similar to those used by General Bonaparte for crossing the Alps on the snow.

52. Two thousand three hundred men can carry filled sandbags enough, in one night, to make the battery and cover the magazine, if they are well organized. Sixty more can carry the platform across and put it down, including the grillage. It will require about four hundred or four hundred and fifty more men to put the guns in position the next night.

53. The skid should have a bearing surface equal to ninety or a hundred square feet.

54. One small creek, about nine feet wide, will have to be crossed. Two or three logs put over it will be sufficient.

55. Thirty-five additional men can carry the magazine and put it up.

56. The work can be done better in daylight than dark, except that it may draw the fire of the enemy.

I have the honor to be, very respectfully, your obedient servant,

EDWARD W. SERRELL,
Colonel Volunteer Engineers.

Major SMITH, *A. A. G.*

57. Subsequently the examinations were pushed down the stream between Lighthouse Creek and Vincent's Creek to various positions, and on the morning of the 30th soundings were made with an iron rod three-quarters of an inch in diameter and thirty feet long.

58. The extreme edges of the swamps on the small creeks are hard, and frequently filled with oysters and oyster shells, but at a few feet from the water they become very soft, and within ten or twelve feet the mud will not afford foothold for a man.

59. In these marshes, back from the harder edges of the creeks, the mud is from eighteen to twenty-three feet deep, generally about twenty feet deep. It is so soft the weight of the sounding iron will carry it down eight or ten feet, and a man can with one hand push it the remainder of the distance.

60. The bottom is hard sand, or has that feeling with the point of the sounding iron.

61. On the mud there is a growth of very coarse grass, spartina glabra and uniola spicata, which is four or five feet high. It does not, however, form a sod, and the roots are not deep, but fine; they afford but little resistance to any thing sinking through them; extreme high water covers the surface of the mud.

62. Geologically the marsh is held to be sedimentary deposits of the very finest particles, brought down by the fresh water streams, and are mostly vegetable. The blowing sands from the outer beaches, which are less recent in their formation, are sometimes mixed with the mud.

63. The resistance is increased by quantities of small shells, auricula bidentata and littorina irroratus, and occasionally muscles.

64. Some idea of the extreme softness of the marsh can be formed by the extent that a couple of men on a plank resting on the surface can shake it, by surging themselves about.

65. The vibrations extend over many hundreds of square yards as if they were on jelly.

66. A general idea of the kind of structure to be built having been formed, preparations were made to obtain the necessary material, and provide the means of getting it on to the ground.

67. The commanding general having ordered that the work should be made suitable for one 200-pounder Parrott rifled gun, and that it should be placed as near to the city of Charleston as practicable, on our side, however, of the

stream next southeasterly from Lighthouse Creek, it became evident that whatever details of plan might be adopted, the general feature of the localities being similar, the primary arrangement would remain constant, wherever the position might be finally determined upon.

68. During the time that preceded the approval of the plan and the commencement of the work on the ground, but after it had been determined to make a battery on the marsh, at some advanced point, the causeway before described leading from the left centre batteries to Black Island was in progress of construction.

69. Finding it practicable to build this road under the enemy's fire, which was sometimes quite heavy, it became apparent that it might be made use of in part at least, to facilitate the erection of the other work, and it thenceforward entered into the plan of operations.

78. As it seemed settled that whatever arrangement might finally be approved would involve the use of large timber in great quantities, working parties were sent to Folly Island at the nearest point where suitable trees could be found, to cut and prepare them and bring them forward ready for use, and as it was determined that the whole parapet must be made of bags filled with sand, a point was selected near the old camp of the engineer troops, and working parties, superintended by the volunteer engineers, were employed day and night filling bags and hiding them from the enemy's view, under cover of the bushes and ridges.

71. The old engineer camp was selected for this purpose because it was one of the two points farthest advanced into the marsh, in the right direction, and afforded plenty of good material and water communication to the battery to be constructed, wherever it might be, between it and Charleston Harbor, on any part of the marsh, if upon the edge of any of the streams.

72. In order to determine the sustaining qualities of the

marsh, and to ascertain what uniformly distributed weight might safely be placed upon it, a platform of three-inch plank four feet square was made and laid on the natural surface.

73. The platform was then loaded with filled sand bags, piled with care in regular layers, until a load equal to four hundred pounds to the square foot was attained; and although the mud was so soft that the bags could not be carried by the men over it, to make the trial, except by walking on boards, the column on the platform remained erect, and after standing twenty-four hours, showed no signs of settlement.

74. The mud was twelve feet deep under the platform where the trial was made.

75. After it had stood for twenty-four hours additional sand bags were piled upon the column, and when it reached a height of about seven feet, corresponding to a pressure of about six hundred and fifty pounds to the square foot, a tendency to lean on one side was manifested; this, however, was supposed to be occasioned by the soldiers tramping about near the corner that went down first. The platform seemed to act in the manner of a punch cutting its way into the surface.

76. After about another hour and a half, additional bags were piled upon the column until a force of about nine hundred pounds to the square foot on the platform had been obtained, when the whole suddenly upset, throwing the sand bags over, burying many of the upper tiers, which fell the farthest, out of sight in the mud; the platform, however, sank but about a foot at one corner, and the trial was considered merely as showing that the sustaining strength of the marsh was equivalent to over six hundred pounds to the square foot, where the load is uniformly distributed. The ultimate sustaining strength was not ascertained.

77. This is represented in Plate D, figure 4; the full

Fig. 6

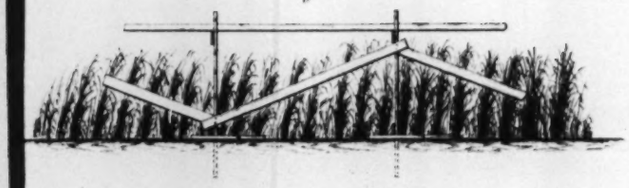


Fig. 5

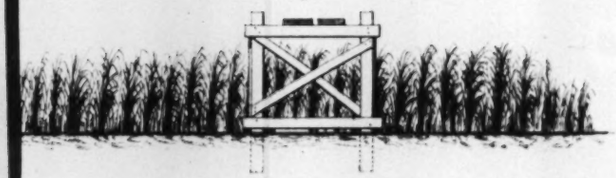


Fig. 4

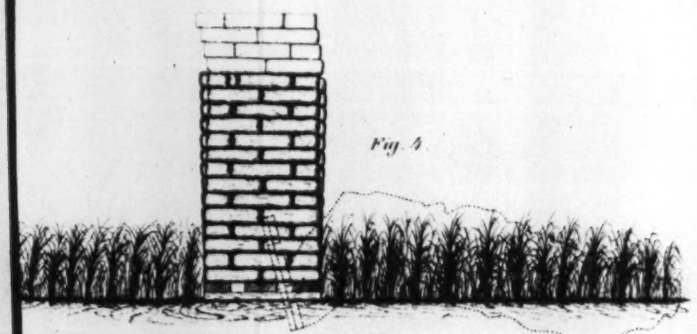


Fig. 3

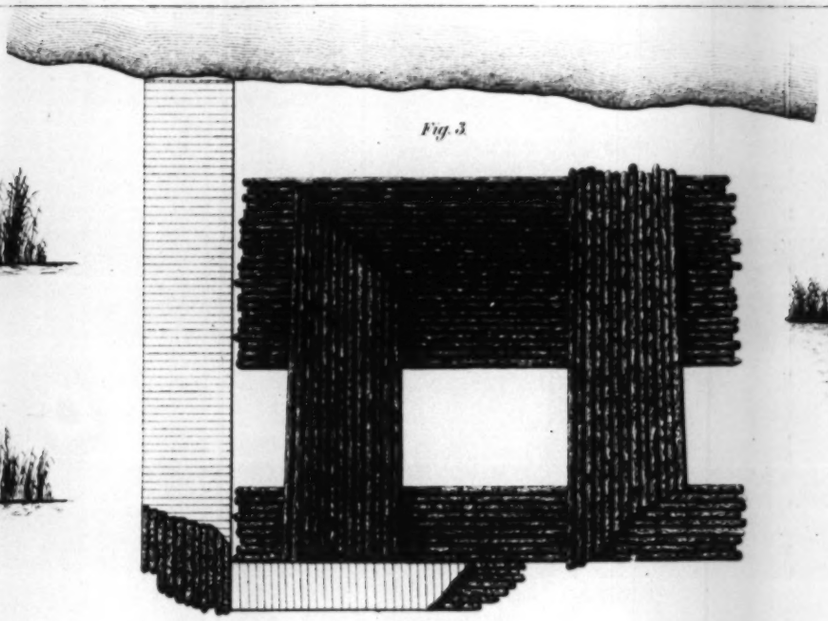


Fig. 1.

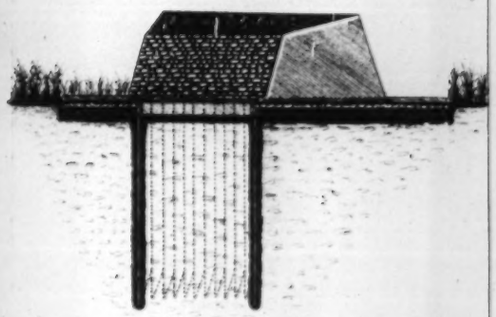
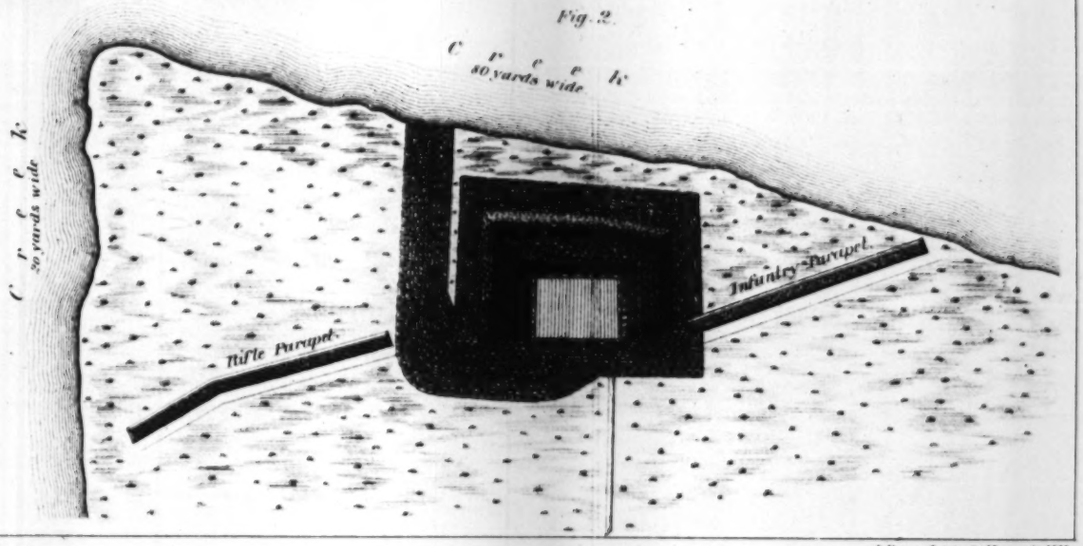
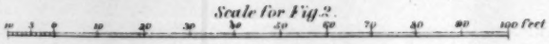


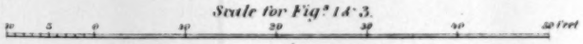
Fig. 2.



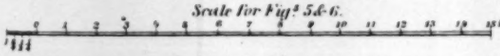
Scale for Fig. 2.



Scale for Fig. 1 & 3.



Scale for Fig. 5 & 6.



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lines represent the weight while the column remained erect, the lighter lines show it as increased in height somewhat inclined, the dotted lines show the column thrown over.

78. A man's foot having a surface of from thirty to thirty-five inches, and sustaining a weight equal to a hundred and fifty pounds, would sink into the mud eighteen to twenty-five inches every step, and if these were not made with some rapidity, much deeper. Two elements are involved here not in the other case; first, that of the motion of the foot, and, second, the suction of the mud against the leg, one tending to favor the penetration, the other retarding it; neither of these conditions applied where the load was static and rested on the surface.

79. In the case of a man attempting to walk it was shown that under the conditions he presented, something like a force of five hundred or five hundred and fifty pounds to the square foot could not be sustained by the marsh, but here there was the heavy weight of the body brought on the small point of the toe, or the side of the foot, or upon some other part of the sole of the shoe, *in motion*. If a battery was to be built, so long as the guns were not fired the forces would essentially be static, and the condition of *rest* became an important element in the calculations.

80. But guns, to be offensively useful, must be fired, and to fire them while floating, as it were, on the surface of the mud, would produce vibrations. How far these vibrations would affect the stability of any structure so situated was still undetermined.

81. If any machinery like a pile-driver was to be employed to make a foundation, provision must be made to hide it during the day and work it at night, or it would be destroyed by the enemy's fire. So large and unhandy a machine as a common pile-engine could not be used. The time required to set it up and take it down during the

short nights of summer would consume too much of the few hours there were left to work in with any degree of security, as was afterwards proved; so for this reason experiments were made with sheet piling of three-inch plank.

82. With a square platform loaded with sand, a long pole was used as a lever of the second power, and a rope sling, with the bight taken twice around the plank and made fast to the pole at the short end, the plank forming the sheet pile was forced into the marsh by a number of men, who applied their own weight to the longer end of the lever. This simple contrivance is represented in Plate E, Fig. 1.

83. This answered very well, but the difficulty of moving the counter-weight was so great in practice that a still more simple, but equally effective method, was used. Instead of a counter-weight a number of men took hold of the pole at either end, and having the plank secured by a sling, it was forced down into the mud until the point reached the hard bottom. when it was driven into the sand securely by heavy wooden mauls. This method is shown in Fig. 2 of the same plate.

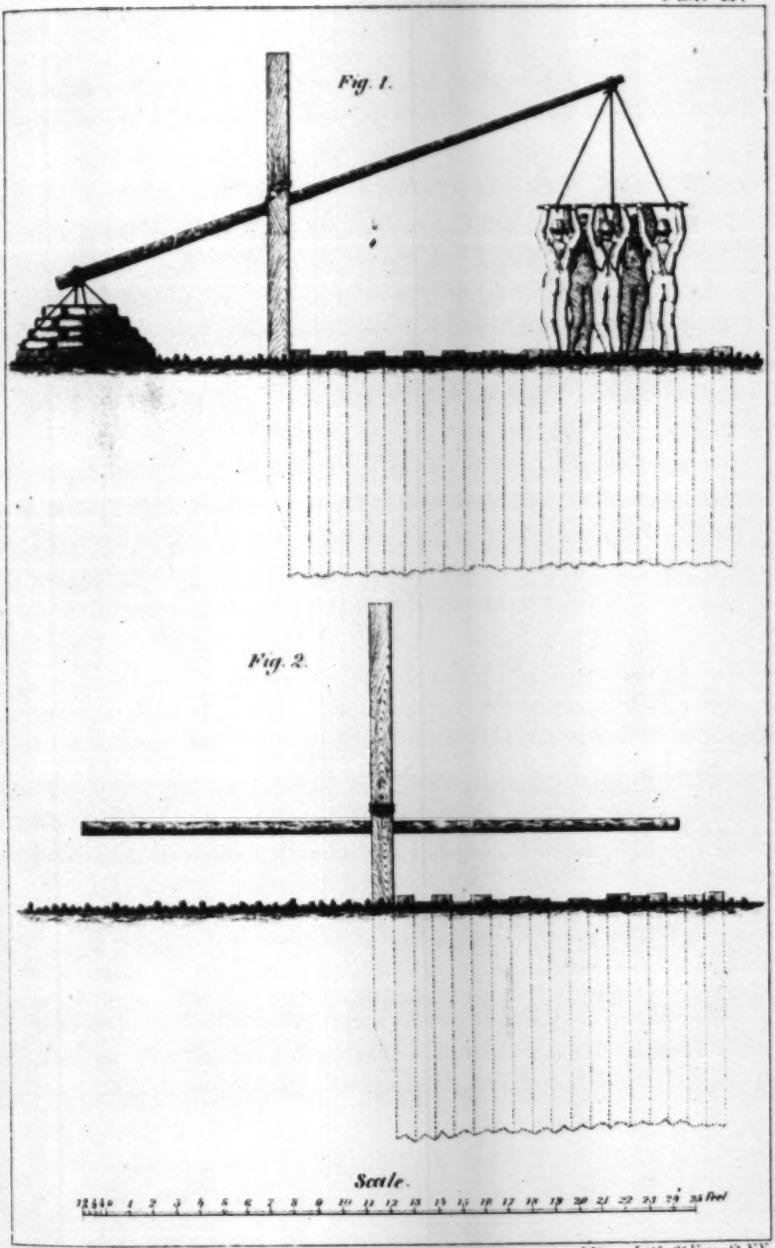
84. On the morning of the 2d of August a general plan for the battery was submitted to the commanding general, who so far approved it as to order an estimate of the labor necessary to build it.

85. The same night this estimate was made, and ten thousand days' work were thought to be required, and the battery was ordered.

86. The plan on which the battery is built is represented in Plate D. Fig. 1 shows a cross-section, Fig. 2 a plan, and Fig. 3 the arrangement of the logs in the foundation.

87. The general theory of the structure is this: The marsh being capable of sustaining a given weight, and no more, to the square foot, and it being necessary to have a certain height and thickness of parapet, which in this case

Plate E.



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J. Bien, Lith. 24 Vesey St. N.Y.

it was thought best to make of sandbags, an equation had to be formed between the size of the foundation and the weight to be supported. In other words, the foundation had to be large enough to support the necessary weight without sinking.

88. This foundation is of grillage, made of large yellow pine logs, crossed and bolted together, and the centre of gravity of the battery, independently of the system upon which the gun rests, is placed in the centre of the platform.

89. The timber work on which the gun rests in the centre of the battery, is in no way connected with the parapet or its foundation.

90. The foundation of the parapet receives a much greater load to the square foot than the gun-deck, and the resultants of the forces are tending rather to elevate the whole structure on which the gun rests, than to allow it to settle.

91. That is, if the battery should sink in the mud, the gun would be left standing on its own foundation, while the displacement would elevate the surface of the surrounding marsh, and tend, so far as it acted through or under the sheet piling which surrounds the gun platform, to elevate it also.

92. Thus, if the epaulement sank upon its foundation, sandbags could be piled upon it indefinitely, while the upheaved mud would form a glacis around it, and the gun would remain in one constant position.

93. The system upon which the gun rests is represented in Fig. 1 of Plate D.

94. It consists of a rectangular figure of sheet piling, driven as before described, within which, and upon the natural surface of the mud, a thick stratum of grass was laid and thoroughly trampled down; on this were placed two thicknesses of tarpaulin, filling the entire space, and on these about fifteen inches of well-rammed sand; over this are three thicknesses of three-inch yellow pine plank.

The lower two courses rest on one another and the sand, and the ends on a welting strip spiked inside the sheet piling; the third, or top layer, includes the heads of the sheet piling, and rests on the course below it and the heads of the piles. The two lower tiers are diagonal to, and the top course is in the line of, fire. The lower courses cross one another.

95. Under the logs of the foundation of the parapet, upon the mud, and transversely to the direction of the lower tier, quantities of grass, cut in the swamp, is laid, and upon this two thicknesses of heavy canvas tarpaulins. The interstices between the grillage logs are filled with sand and the bags broken in transportation, and around the logs are piled other broken bags, in the nature of a ramp, and to give additional weight on the surface, or near the surface, of the surrounding marsh, to keep it from rising unequally if the battery should sink.

96. On the left of the battery, a road was made, leading from the gorge around the left flank to the edge of the creek. It is formed of logs and planks transversely bedded in the mud, and has a layer of sandbags over it. The gun and gun-carriage and system of timber work, forming the authorized gun platform, were taken over this road from boats brought to the landing-place, at one end of it, at high water.

97. During the time the battery was in course of construction, all the material was carried by boats, and many of the details—all of them, at first—went to the work and returned in this way; but as soon as practicable a plank walk was built to the Marsh Battery from the angle of the road between the left centre breaching batteries and Black Island, and after the night of the 12th of August most of the workmen were marched over it. A platform was built near the intersection, on which the reserve of the covering party were placed by order of General Terry.

98. To secure the working parties against surprise, picket

boats were kept in the stream leading to James Island and Charleston harbor, and two naval boats with bow howitzers were also stationed by the admiral in the same waters.

99. During the night of the 12th of August, a boom of heavy round pine logs, chained together, was put across the creek, at the point indicated on the map, and securely anchored to the banks, to obstruct the passage of boats that might attempt to come up from Charleston harbor.

100. The work was done under the direction of Lieutenant Charles Parsons, Volunteer Engineers.

101. In the construction of the Marsh Battery, I was assisted on the ground by Captain Charles P. McKenna, Lieutenant Nathan M. Edwards, and Lieutenant Charles B. Parsons, Volunteer Engineers.

102. The gun in this battery is a 200-pounder Parrott rifle, upon an iron carriage, with the authorized wooden platform resting on the gun deck. It is manned by a detachment of Colonel Plaisted's Eleventh Maine Regiment, commanded by Lieutenant Sellmer.

103. In the construction of the Marsh Battery, the following labor and materials were expended:

104. 13,000 sand bags.
123 pieces, 15 to 18-inch diameter, yellow pine timber, 45 to 55 feet long.
5,000 feet 1-inch boards.
8 paulins, 18 × 28-feet each.
9,516 feet 3-inch pine plank.
300 pounds 7-inch, and 300 pounds 4-inch, spikes and nails.
600 pounds round and square iron.
75 fathoms 3-inch rope.

105. These quantities do not include the material or labor employed in the bridges and plank walk across the marsh, and the boom, or on the road and pier at the old engineer camp, which were incidental to the construction of the battery.

106. *Table of Average Haul.*

	No. of Tons.	No. of miles moved.	Equal to	
			No. of Tons.	Miles moved.
Timber	307	7½	2,302	1
Lumber.....	28	3	84	1
Sand and Sand Bags..	812	1½	1,218	1
Total.....			3,604	1

107. Average pressure on the foundation of the battery, 513 pounds to the square foot.

108. Average pressure on the gun deck, 123 pounds to the square foot, at rest.

109. The elevation of the gun from 35° to 37°.

110. Greatest range by coast survey map, 9,240 yards, or 5¼ miles.*

111. Table of labor expended in construction of Marsh Battery: 91 days' work of engineer officers, 1,384 days' work of engineer soldiers, 7,390 days' work of infantry, 172 days' work of four-horse teams, 93 days' work of boats.

112. During the night of the 10th of August I tested Mr. Grant's calcium light, from the left centre batteries, and found that the illumination was sufficient to be serviceable in siege operations. The light was not, however, used under my immediate observation, except in this first experimental trial.

113. During the night of the 16th of August, Captain F. E. Graef, Volunteer Engineers, made a covered way from the mortar batteries, in the rear of the first parallel, to the first parallel, and then extended it to the rear some distance, to include the Beacon House. The same day the roads to Black Island and the Marsh Battery, which had

* I do not understand the meaning of paragraph 110.—Q. A. G.

previously been built, were strengthened and widened, by a working party under Captain S. C. Eaton, Volunteer Engineers. This is represented in Figs. 5 and 6, Plate D.

114. Captain Graef directed the construction of the road from the junction to the Marsh Battery, and was assisted by Lieutenant J. C. Baldwin, Volunteer Engineers.

115. On the night of the 17th of August the Marsh Battery was ready for the gun, and Lieutenant Wadlie, Third New Hampshire Volunteers, and Lieutenant Parsons, Volunteer Engineers, made their preparations to put the gun in place.

116. This was done by first carrying the timber parts, and then the iron work of the carriage, to the battery in boats, and landing them at the point previously prepared on the edge of the marsh, as shown in the drawings.

117. *August* 19.—In connection with Major Brooks, Aid-de-Camp, organized four sap brigades for approaches against Fort Wagner.

118. Between the 18th and 20th of the month, a netting, made of large ropes and floated on barrels, was put across Lighthouse Inlet by Lieutenant R. F. Butt, Volunteer Engineers, to catch torpedoes or other incendiary bodies, intended by the enemy to float down Lighthouse Inlet and destroy our shipping in the harbor. This contrivance is represented in Plate F, where Fig. 1 is a general elevation; Fig. 2, a plan; Fig. 3, an enlarged view of one panel; Fig. 4 shows the method of securing the floats, which are barrels; *a*, *a*, are ten-inch mortar shells hung to pieces of rope, to keep the whole steady and vertical.

119. During the night of the 21st of August, another platform, large enough to hold two hundred men, to serve as a covering party, was constructed on the marsh, near the junction of the causeways; and to the left and front of this position, out in the marsh, a mock battery of boards and grass was built by Lieutenant N. M. Edwards

and Lieutenant Hartmann, to draw the fire of the enemy, in which the device was eminently successful. At this stage of the work a magazine was made on the hard ground at the easterly end of the causeway, which was intended for supplying the Marsh Battery. Yokes were also made to fit on the necks of men to carry powder, but it was afterwards found that boats could be most advantageously used for that purpose.

120. It having been reported at headquarters that some difficulty had occurred during the night at the Marsh Battery, an examination and the following report was made:

121. HEADQUARTERS DEPARTMENT OF THE SOUTH,
MORRIS ISLAND, S. C., ENG. OFFICE, Aug. 22, 1863.

MAJOR,—I have the honor to report that, agreeably to orders from the commanding general, I have examined the battery on the marsh, and find that the foundation, parapet, and system of piles, including the gun deck—in fact, everything, excepting the gun and its parts—are in perfect order.

122. The arrangement of parts that prevented the wooden platform from sliding on the gun deck, having been removed by some person, to me unknown, the gun, and all its parts down to the deck, have slidden to the rear some twenty inches.

Very respectfully, your obedient servant,

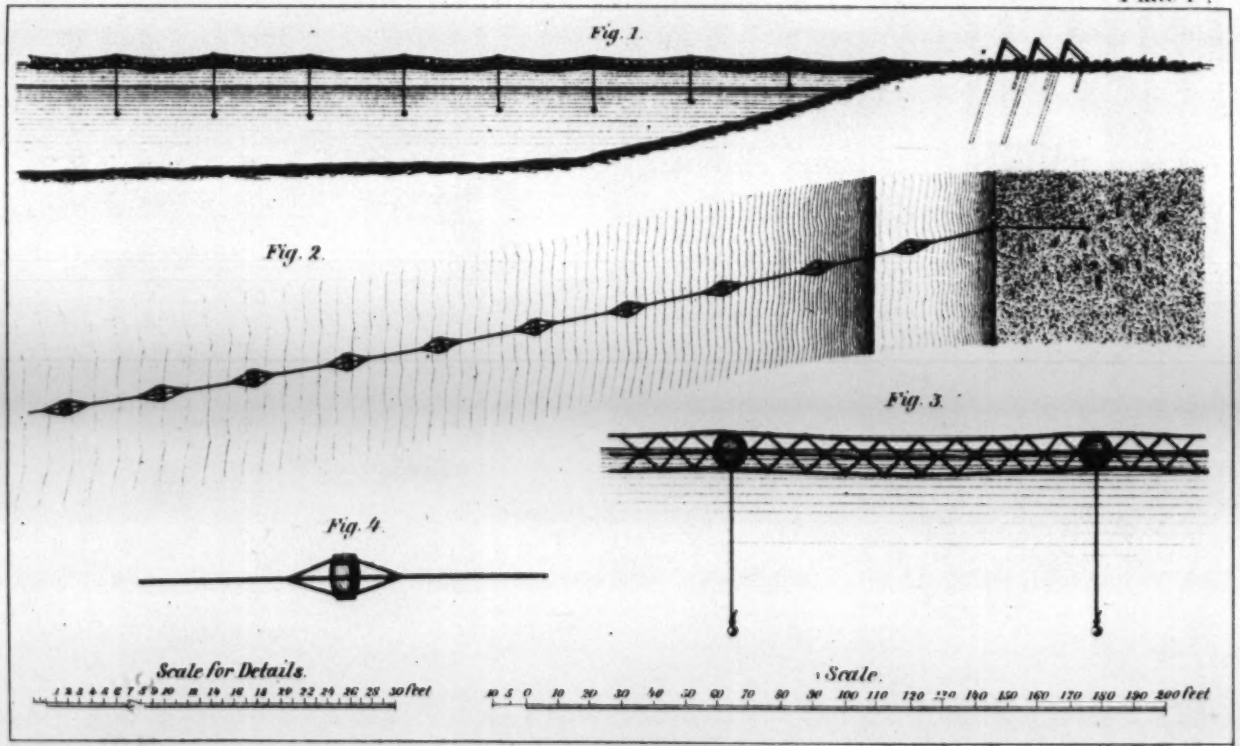
E. W. SERRELL,
Col. and Asst. Engineer, Dept. of the South.

Major E. W. SMITH,
Asst. Adjt.-General, Dept. of the South.

123. The difficulty was remedied by spiking heavy cleets on to the gun deck, and firing was resumed.

124. On the morning of the 23d of August, orders were received from the commanding general, to put three 30-pounder Parrott rifled guns on Black Island, and so to build the batteries for them, and construct platforms, that

Plate F.



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J Bien. Lith. 24 Vesey St. N.Y.

they could fire over the enemy's works on James Island, directly upon the city of Charleston. The range, as ascertained by the coast survey map, was required to be eight thousand eight hundred yards.

125. The work was immediately commenced and a covered way run from the camp near the centre of the island to the extreme right, or nearly so, and the batteries were built as shown in Plate G.

126. Plate G represents these batteries on an enlarged scale. Figure 1 shows all four batteries together; figure 2 is a section on *a b*, of figure 1; figure 3 is a section on *c d*, figure 1; figure 4 is a cross section on *e f*, figure 1; figure 5 is a cross section on *g h*, figure 1; figure 6 is the magazine and the right of the covered way; figure 7 represents the method of taking the 100-pounder gun across the marsh; *i* is a side view and *k* an end elevation.

127. The 30-pounders were taken from the ordnance yard on Morris Island in a small scow, and, mounted on siege carriages without limbers, were afterwards drawn across the marsh about one hundred and fifty yards, in the dead of night, in a heavy storm of rain.

128. The roadway across the marsh was made by throwing down a layer of brush, say three feet deep; on this, which was well trampled down, were placed transversely one-inch boards, which were the best that could be obtained, and longitudinally over these were three-inch planks, for the wheels to run upon.

129. The 100-pounder gun was taken further up the creek to the right, and, having been provided with a wooden cylinder secured around the cone of the chase by iron hoops after the manner of staves, and corresponding in diameter with the reinforce, was parbuckled and rolled over the marsh on two thick planks.

130. Some difficulties having occurred with the iron carriages used with the Parrott rifle gun, but, more particularly, as there were fewer of them in the department than were

required for use, and as the commanding general desired to fire these guns at a higher angle of elevation than the authorized carriages admitted of, two experimental carriages were made which are represented in Plate H.

131. The object of these carriages being to admit the use of large angles of elevation, the top carriage was so made that the whole rear of the gun, including the reinforce, passed between the side cheeks, the cascabel clearing the rear transom of the top carriage.

132. They were made of the common hard pine of the country, hewed in the woods. These carriages worked well, and possessed the advantage of being easily made; any engineer company can construct them in almost any part of the southern department, from material found in the country, except a few iron bolts and trunnion plates, which were easily made at the portable forge. I think they will be found as good or better than the authorized iron gun carriage.

133. A modification of this plan is used at Black Island for a 100-pounder gun at the right batteries. The only difference consists in an eccentric shaft being used with the top carriage. This carriage is represented in Plate I.

134. They have not yet been sufficiently tested to determine their value, but everything indicates durability and sufficient strength. The carriage represented in Plate H requires roller handspikes to manœuvre it, but is otherwise more simple than that represented in Plate I.

135. The batteries on Black Island having been constructed for the purpose of firing in one constant direction, no provision was necessary in the carriages for a horizontal field.

136. The peculiar arrangement of the right batteries represented in Plate G, was to admit of a gun mounted on a siege carriage being fired at a very high elevation, the trail of the gun carriage drops into the pit and rests on the lower platform, the wheels are supported by the upper

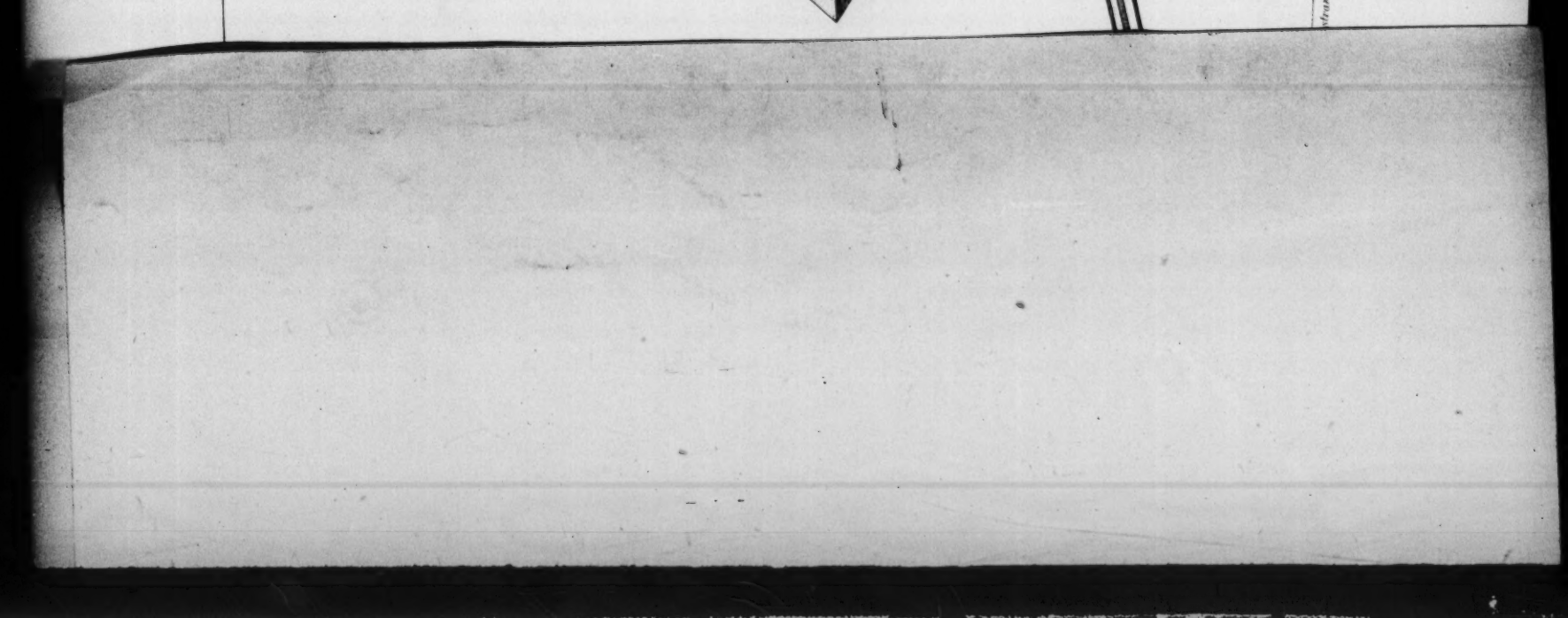


Fig. 7.

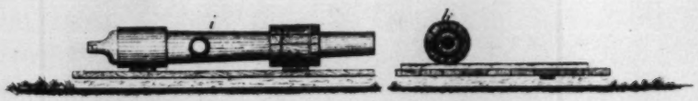


Fig. 2.

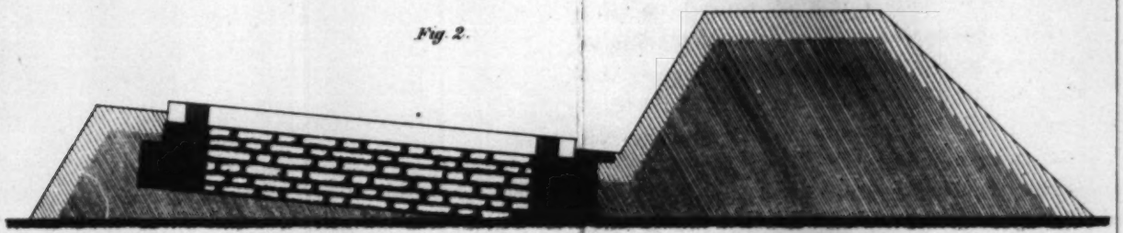


Fig. 1.

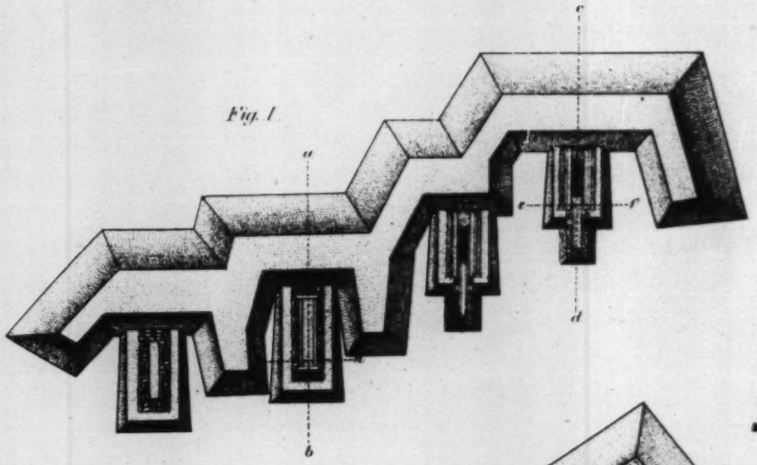
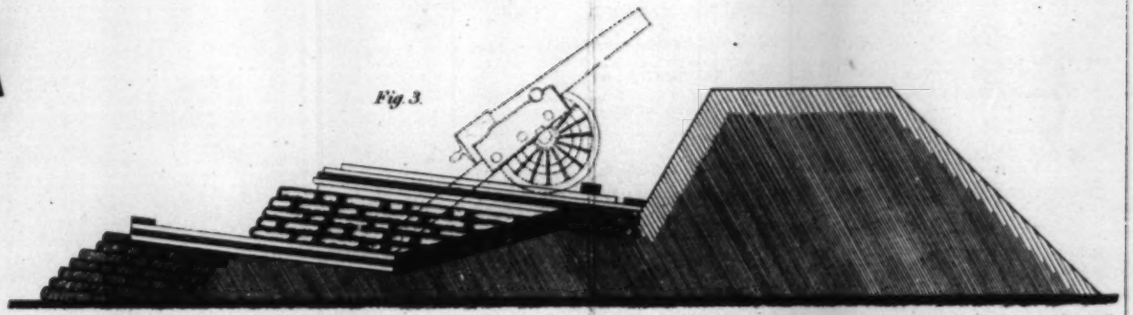
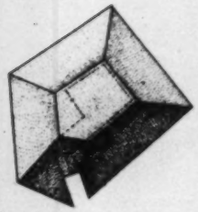


Fig. 3.





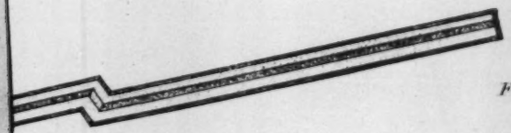


Fig. 6.

Fig. 4.

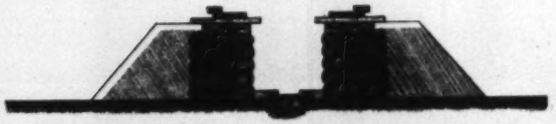
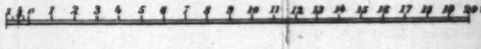


Fig. 5.

Scale for Figs. 1 & 6.

Scale for Figs. 2, 3, 4, 5 & 7.



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J. Bien, Lith. 24 Vesey St. N.Y.

70-96-07

Fig. 1.

100 Pdr. Parrott Gun Carriage and Chassis.

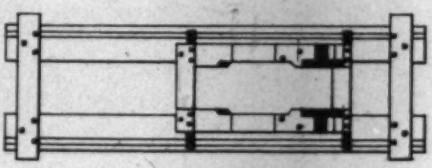

Fig. 2.

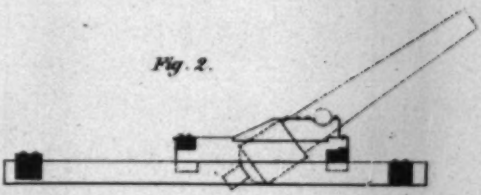

Fig. 3.

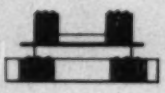

Fig. 4.

30 Pounder Parrott Gun Carriage & Chassis

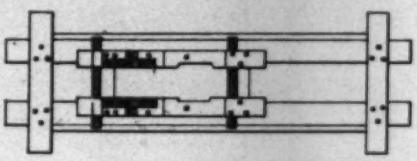

Fig. 5.

Fig. 6.

Scale

0 1 2 3 4 8 12 16 Feet

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Fig. 1.

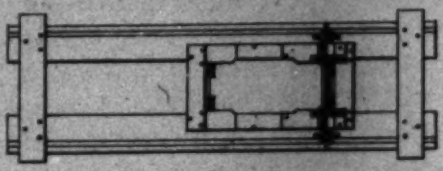


Fig. 2.

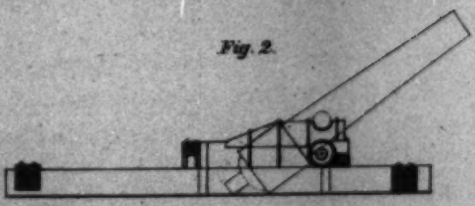
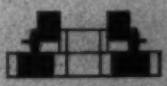
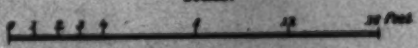


Fig. 3.



Scale.



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J. Bien, Lith. 26 Vesey St. N.Y.

platform, the platforms being parallel to one another, the recoil takes place without changing the vertical angle of the axis of the piece.

137. The platforms are laid at an angle of 5° from the horizontal, rising to the rear. These batteries work very well, but I am of opinion that it would be better to have a less inclination of the platforms.

138. A pier was constructed during the latter part of July by Captain Walker, Volunteer Engineers, at Pawnee Landing, Folly Island. It was for the purpose of facilitating transportation from Folly River to Morris Island.

139. A fortification, for a garrison of two hundred men, is now in course of erection upon the left of Black Island. I shall have the honor to describe this work in some other report.

140. A permanent pier one hundred and fifty-five feet long, thirty-one feet wide, and having a T sixty-nine feet long, has been constructed and is now nearly ready for use at the south end of Morris Island, near the ordnance yard. This pier extends out into the channel of Lighthouse Inlet to nine feet of water at low tide; it is very strong and substantial. The piles were all driven by a hand engine, the timbers were obtained upon Folly Island, and brought to and across the river with great labor. This work is under the direction of Major Richard Butt, Volunteer Engineers.

141. During the siege, there had been made, under the direction of Lieutenants Mehles and Harold, Volunteer Engineers, 1,429 gabions, 464 fascines, 11 sap-rollers, and 4 anchor baskets.

142. During the bombardment, Lieutenant W. H. Baldwin, Volunteer Engineers, had charge of the repairs of the first parallel and the mortar batteries in the rear.

143. Lieutenant James Baxter, Volunteer Engineers, while directing the construction of the naval batteries, was dangerously wounded.

144. Where all have done so well it is impossible to make distinctions.

145. To the officers and men of all arms I am greatly indebted for hearty co-operation and assistance. The fatigue duty has been excessive, but it has, under the most trying circumstances, in all cases, been most cheerfully performed.

146. Individual acts of heroism and personal bravery have been of daily occurrence. Nothing has seemed too hazardous to undertake or too difficult to execute.

147. The establishment of the engineer depot on Morris Island by Captain Frederick H. Cruso, and the manner in which he conducted the manufacture of large quantities of engineer material, while under my direction, during the early part of the siege, was satisfactory. Captain Cruso was assisted by Lieutenant Richard Coe.

148. The following-named officers have acted as my assistants, and it is with great pleasure that I present them to your favorable consideration: Major Richard Butt, Captain Frederick E. Graef, Captain Samuel C. Eaton, Captain Joseph Walker, Captain John L. Suess, Captain Charles P. McKenna, Lieutenant Edward N. Kirk Talcott, Acting Adjutant, Lieutenant Hiram Farrand, Lieutenant James Baxter, Lieutenant Patrick McGuire, Lieutenant Henry Mehles, Lieutenant Charles Wilkins, Lieutenant Charles B. Parsons, Lieutenant Nathan M. Edwards, Lieutenant James H. Harold, Lieutenant James Baldwin, Lieutenant William H. Baldwin, all of the Volunteer Engineers.

Very respectfully, your obedient servant,

EDWARD W. SERRELL,

Col. Vol. Engs., Asst. to Ch. Eng, Dep. of South.

Maj.-Gen. Q. A. GILLMORE,

Commanding and Chief Engineer, Dep. of South.

NOTE.—The drawings accompanying this Report have been prepared by Corporal Edwin D. Doolittle, assisted by artificers and privates of the volunteer engineers.

Plate K.

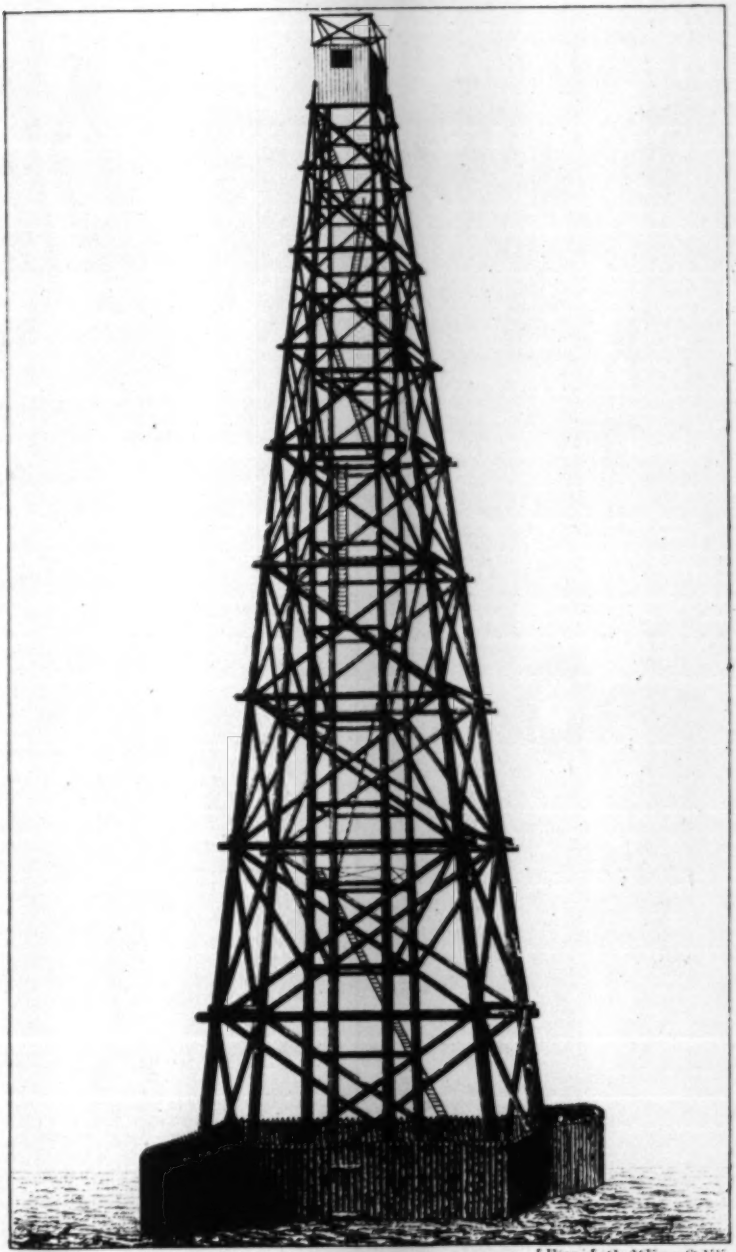

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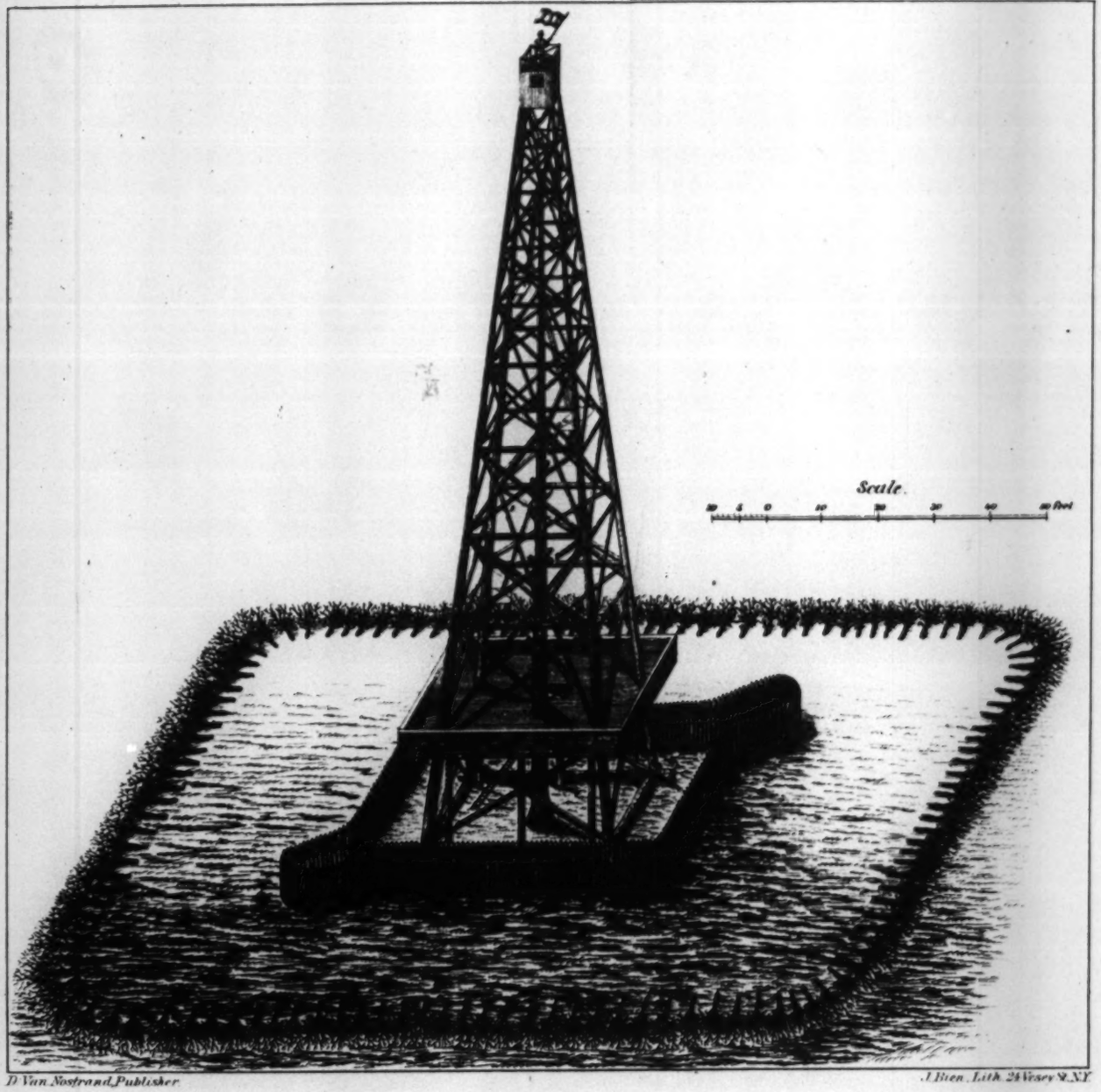
Plate I.



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J. Bien. Lith. 24 Vesey St. N.Y.

DEPARTMENT OF THE SOUTH, HEADQUARTERS IN THE FIELD,
ENGINEER'S OFFICE, FOLLY ISLAND, S. C., January 6, 1864.

CAPTAIN,—I have the honor to report, for the information of the major-general commanding, that the line of signal towers from these headquarters to Hilton Head is now completed and in operation.

Beginning at Hilton Head, the line commences at the old headquarter building, from which it was proposed to telegraph to the signal tower erected at the junction of the roads between Beaufort and St. Helena village, and that leading to the Episcopal church on St. Helena Island, but the distance was found to be too great, and an intermediate station has been established at Jenkins' Plantation, eight and a quarter miles from Hilton Head. This is merely a reading-room and platform. From Jenkins' to the tower, six and a half miles, communication is made by military magnetic telegraph.

The tower upon St. Helena Island is formed upon three very large hard pine trees, and over them, framing in successive sections up to a total height of one hundred and thirty-eight feet above the ground.

The next tower is at Otter Island,* eight and a half miles farther up the coast. The framework is two towers, one within the other, counterbraced. The total height is one hundred and forty-two feet above the ground. This tower is stockaded, and could, with a good garrison, hold out against an attack of the enemy for some considerable time. The stockade is flanked by tambours at two angles.

The next station is at Bay Point, Edisto Island, distant five miles from Otter Island. This is merely a temporary work, forty-three feet high, sixteen feet square, and stands on a sand hill about eighteen feet above high-water mark. It is surrounded by abatis, but is not otherwise fortified.

The next point is at Botany Bay Island, where there is a tower one hundred and thirty-eight feet high above the ground and thirty feet square at the base.

* This tower is shown in the accompanying drawing, Plate K.

This tower,* being at a very exposed point, has been well fortified by stockade, flanked by tambours on the angles, and with abatis outside. The entrance is by ladders over the abatis and stockade. These ladders are movable, and are to be drawn in at night, or in case of an attack. In the tower, eighteen feet above the ground, there is a platform of timber, surrounded by a loopholed wall of timber four feet high and seven inches thick. This tower should be able to resist a strong attack.

RECAPITULATION.

Hilton Head to Jenkins', ...	8½ miles,
Jenkins' to St. Helena, ...	6½ "
St. Helena to Otter Island, ...	8½ "
Otter Island to Bay Point Island, . .	5 "
Bay Point to Botany Bay, ...	9½ "
Botany Bay to Folly Island, south end,	14 "
To Department Headquarters, Folly Island,	3¼ "
Total, ...	55¼ miles.

The towers at Botany Bay and South end of Folly Island are too far apart for service in bad weather, and an intermediate small station has been erected on Kiowa Island. Those on Folly Island do not form a part of the subject of this Report.

The towers at Kiowa, Botany Bay, Bay Point, Otter Island, St. Helena Island, and the station at Jenkins, were built by Lieutenant Charles F. Hartmann, from plans furnished from this office. The work was done by three detachments of volunteer engineers, assisted by fatigue parties of infantry.

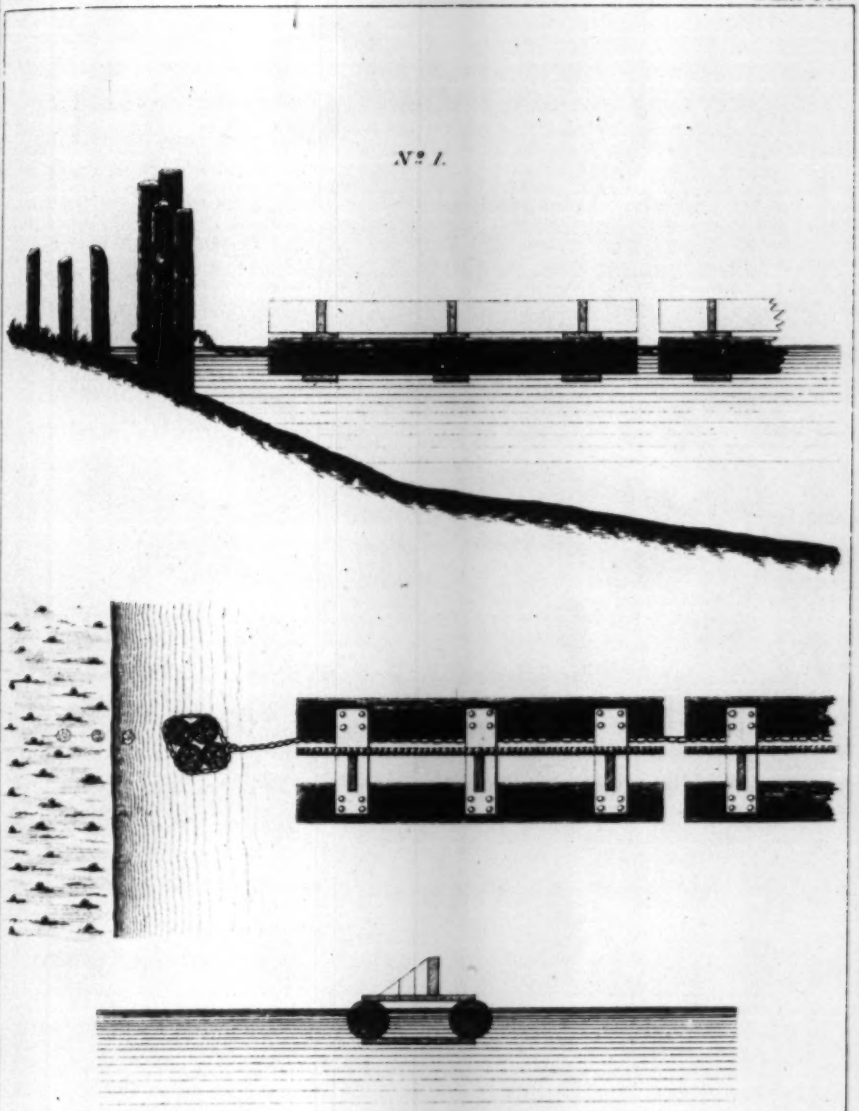
Very respectfully, your obedient servant,

EDWARD W. SERRELL,

Col. Vol. Engs. and Asst. Eng., Dep. of South.

Captain BURGER, *A. A. G. Dep. of South.*

* This tower is represented by Plate L.



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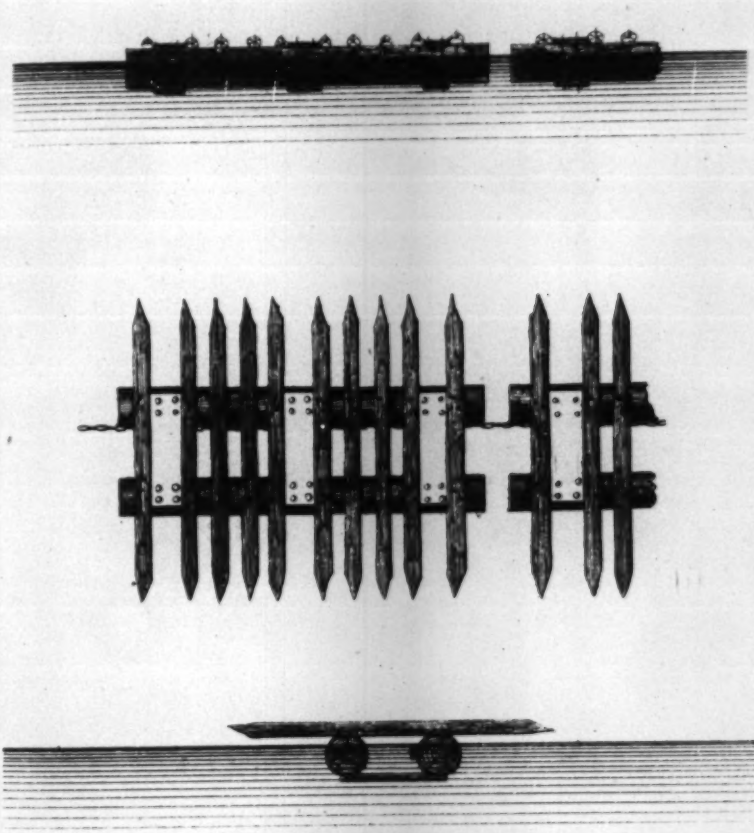
J Bien, Lith. 24 Vesey St. NY

Fig. 2.



Scale

0 1 2 3 4 5 6 7 8 9 10 20 Feet

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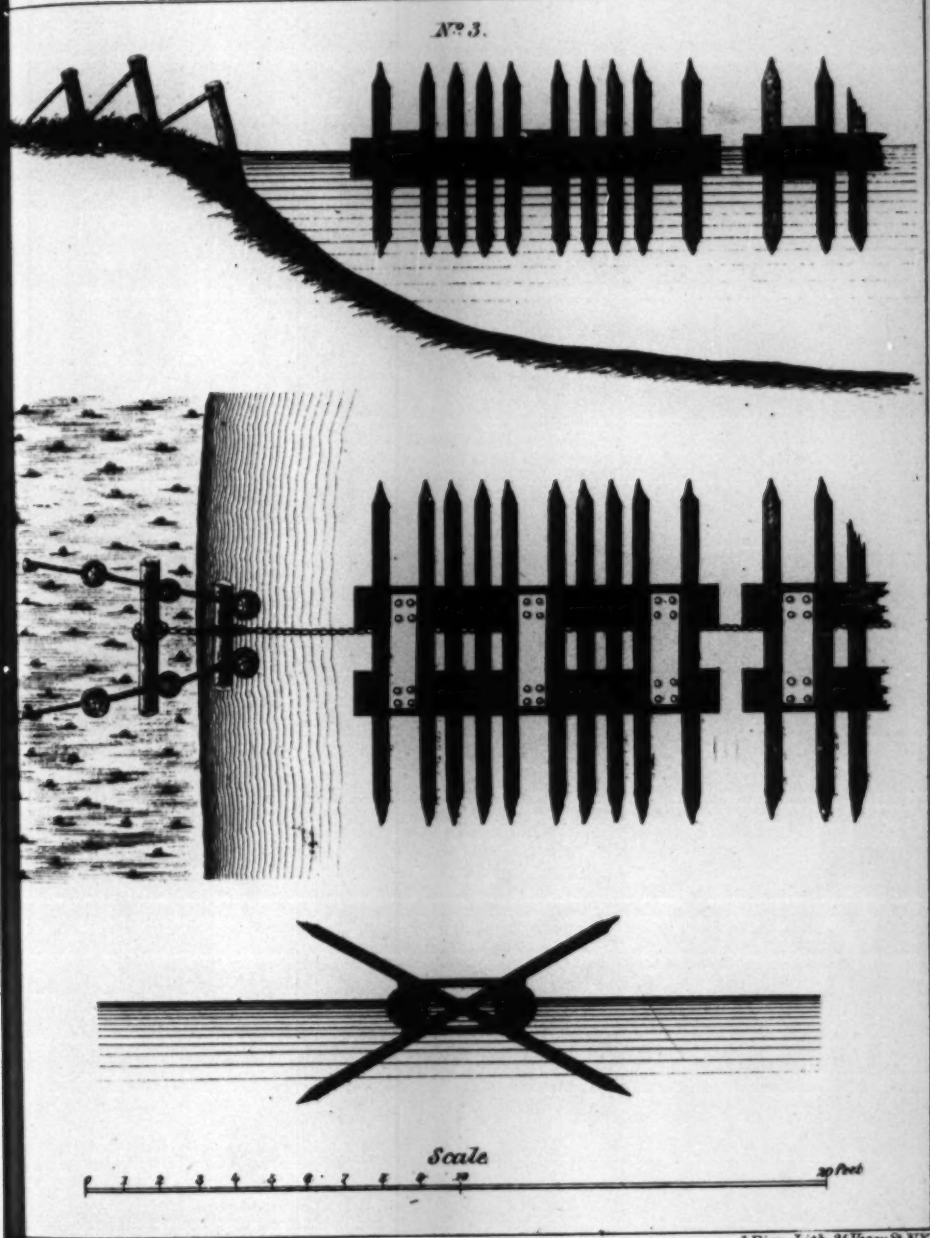
J Bien, Lith. 24 Vesey St. N.Y.



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NOTE.

The following drawings represent the booms used to obstruct the water communications between our positions on Morris and Folly Islands and the enemy. For obvious reasons, their positions are not designated at this date. Plates M, N, and O represent in plan, elevation, and cross section, the method of construction. I consider Plate O the most desirable form to use; no boat or other floating body can pass over it without first submerging the logs and frieze, and if turned upside down the obstruction still presents itself. Great attention has been paid to this matter, many hundred yards of booms like these have been constructed and put in place. E. W. S.

APPENDIX D.

LIEUTENANT SUTER'S REPORT.

HILTON HEAD, S. C., January 22nd, 1864.

GENERAL,—In accordance with your verbal instructions, I have the honor to submit the following report of the batteries constructed under my direction on the north end of Folly Island, and which were used in the attack on the 10th of July.

On the 14th of June you instructed me to put the following ordnance in position on the north end of Folly Island: Twelve 30-pounder Parrotts, four 20-pounder Parrotts, six 10-pounder Parrotts, six Wiard guns, ten 10-inch siege mortars, and five 8-inch siege mortars.

You directed that every precaution should be taken to prevent the enemy discovering our operations. I had four companies of the New York Volunteer Engineers at my disposal. These companies were commanded by Captains Cruso and Suess, Lieutenants Maguire and Vernum. Major Place, who commanded the battalion, was so sick as to be unable to leave his tent.

I staked out the batteries on the 17th of June, and ground was broken that night. Four 3-inch rifles had in the meanwhile been added to the armament.*

* * * * * * * * *

These batteries, with the exception of I and K, were situated in the sand hills which line the beach of Light House Inlet. The other three were placed in a patch of woods about one hundred yards behind the first line, and separated from it by a marsh. The batteries of the first line were all begun at once, those of the second line

* This armament is given on page 25.

not until June 25th. On the 8th of July another battery for two 8-inch rifles, "en barbette," was constructed between Nos. 4 and 5. The final armament was as follows:—*

Guns,	32
Mortars,	15
Total,	47

On the 18th Second Lieutenant James E. Wilson, Fifth Artillery, reported to me for duty.

The work from this time was pushed forward night and day with as much rapidity as was compatible with secresy. A large amount of engineer material was brought to Folly Island on the 21st of June.

On the 22d, I appointed as my assistants Lieutenant P. McGuire, New York Volunteer Engineers, and Lieutenant James E. Wilson, Fifth United States Artillery. They alternated with each other for duty in the batteries, each remaining twelve hours in the works. I also established an engineer depot, which I placed in charge of Captain Cruso, New York Volunteer Engineers. Sixteen artificers of his company were detailed at the depot. The remainder of the company worked in the batteries. All the engineer material passed through this depot.

By the 26th all the batteries were finished with the exception of platforms and magazines.

On the 1st of July First Lieutenant P. S. Michie, United States Engineers, reported to me for duty, and in compliance with orders from yourself, I turned over the work to him and returned to Hilton Head.

* * * * * * * * *

During the time which elapsed between my departure and the 10th of July, the batteries were all completed, and the embrasures cut through the sand hills in front of them. During the night of the 9th the trees and brushwood were

* See Plate II.

all cut away and the embrasures cleared, so that all was ready on the morning of the 10th, when fire was opened.

For about a week the enemy kept up a brisk fire upon the place where we were working. The firing was principally from mortars, and was very accurate. Fortunately there were not many casualties.

The details at first worked principally at night, because we could not handle earth in the daytime without being seen. As the work progressed the amount of labor which could be done by daylight increased, and the day details were proportionately augmented.

The details were as follows:—

	NIGHT.	DAY.
From June 17 to 25.....	500 inf. 38 eng'rs.	35 engineers.
" " 25 to 28.....	" " " "	80 inf. 35 eng'rs.
" " 18 to July 9.	300 inf. 38 eng'rs.	200 inf. 65 engr's.

The night detail was formed at the look-out* and marched to the batteries immediately after sunset. They were relieved by the day detail between 2 and 3 o'clock A. M.

The difficulties which we had to contend with in constructing these batteries were very great, on account of the special conditions imposed.

The enemy's pickets were separated from the working parties only by the width of Lighthouse Inlet, and at that distance any noise could easily be heard, and its peculiar nature distinguished. When the surf was heavy, this trouble no longer existed; but their close proximity and extreme vigilance were very annoying during the daytime and on moonlight nights. They also established a look-out on the masthead of the wrecked blockade-runner Ruby. I suppose that the high ground on the right of our line masked the batteries farther to the left, but it is diffi-

* This look-out is nearly two miles south of the north end of Folly Island.

cult to understand why we were not discovered from this point, as by going a few paces to the rear of our right batteries, this look-out could be plainly seen. They had also a look-out station built on the ruins of the old lighthouse, and from this we were constantly watched. From the large look-out at Secessionville, they also had a good view of the ground on which we worked.

A narrow, open beach, separated the woods near the look-out, from the small patch just in rear of the batteries. Everything which passed up this beach in the daytime could be plainly seen by the enemy, and it is surprising that they did not make out our teams on moonlight nights. The small patch of woods before alluded to was useful for concealing the guards of the trenches. The second line of batteries was also located in it.

In order not to attract notice to our work, great care was taken not to disturb any of the natural features of the landscape. Trees and bushes were left standing in the batteries to the last moment, and when the laying of platforms absolutely required their removal, they were only moved a short distance, and then stuck in the ground, or placed against the traverses or parapet. They were never removed entirely, until everything was completed.

A great deal of trouble was experienced with Battery D, which was located in a rift in the sand hills, without cover of any kind. The newly excavated sand was of a different color from that which had been exposed to the sun, and after the night's work was over, it had to be sprinkled over with dry sand. Care was taken, in throwing it out, not to allow any abrupt changes of altitude in the crest of the parapet. It had to be gradually raised in the centre nearly two feet, to cover from view the top of the magazine; but this was successfully accomplished. Great trouble was also occasioned by the blowing of the loose sand, which had constantly to be renewed.

The batteries were of the usual dimensions. The para-

pets, at least twenty feet thick, were generally much greater, being formed by the sand hills themselves. The uniform height of parapet was eight feet. All the guns were in embrasure, except two light field pieces in front of Battery D. The platforms for the siege guns were made of three-inch plank, resting on five sleepers formed of heavy pine logs, rough-hewn on one side. The whole space for two guns was usually covered, to avoid cutting the plank. The platforms for field pieces were composed simply of three planks, one under each wheel, and one under the trail. The mortar platforms were those furnished by the ordnance department. A traverse was allowed to every two guns and mortars. Some extra ones were put in for the purpose of concealment. Their dimensions were also regulated by the same necessity.

The magazines were calculated generally for four guns or mortars, and were mostly made 6 feet × 12 feet by 5 feet 6 inches. The mortar magazines had a shell-room attached. The magazines for field pieces were smaller, being intended merely to shelter the ammunition chests. They were covered with sand bags or fascines, and, in the case of Battery D, with palmetto logs. The thickness of earth on top was about seven feet.

Sand bags were used exclusively in revetting the parapets and traverses. The embrasures were mostly revetted with hoop iron gabions. In the field batteries, fascines covered with hides were used, and sometimes hides alone. In the mortar batteries, only the traverses were revetted. In Battery D, however, the parapet was revetted about two and a half feet high with palmetto logs, on account of the sand being very fine and loose.

Small splinter-proofs were placed in all the batteries. They were made by leaning heavy logs against the parapets, or, in fact, wherever there was room, and covering them with sand about two feet deep.

A large bomb-proof surgery was built in rear of Battery

A. It was about thirty feet long, by six feet wide, by six feet high. It had three doors, and good ventilation.

The guns, when placed in position, were screened by bushes.

The greatest difficulty was in the transportation. The teams had to drag all the material from the look-out, or Pawnee Landing, to the batteries, a distance of two miles or more, and could only get along the beach when the tide was low. They could rarely make more than two trips a night. Only horse teams were used.

In conclusion, I beg leave to call your attention to the valuable services rendered by Lieutenants Wilson and McGuire, to whose constant supervision the success of the work is mainly due. Lieutenant Michie has my thanks for the manner in which he carried out my plans after my departure for Hilton Head. The services since rendered by this officer, render any further mention by me unnecessary.

I remain, General, very respectfully,

CHARLES R. SUTER,

1st Lieut. U. S. Engrs., and Asst. Eng. Dept. South.

To Major-General Q. A. GILLMORE,

Commanding Department of the South.

APPENDIX E.

REPORT OF LIEUTENANT MICHIE.

ENGINEER OFFICE, NORTHERN DISTRICT,
DEPARTMENT OF THE SOUTH,
FOLLY ISLAND, Feb. 1, 1863.

Major-General Q. A. GILLMORE,
Commanding Dept. of the South and Chief Engr.

GENERAL,—In compliance with your request, "that I should send in, as soon as possible, a detailed report of my engineering operations in this department previous to the 7th of September, 1863," I have the honor to submit the following.

I reported for duty at headquarters, Department of the South, Hilton Head, South Carolina, on the 29th of June, 1863, and was ordered to report to C. R. Suter, First Lieutenant United States Engineers, whom I relieved on the 1st of July, 1863, of the charge of the offensive batteries under construction on the North end of Folly Island, South Carolina. At this time the sites of all the batteries had been selected, (except that of a small barbette battery of two Wiard guns, which was established, on the night of the 9th of July, between the right and left wings of the first line,) and the interior revetments of sand bags completed.

The immediate supervision of the work was under the charge of Lieutenant Wilson, Fifth United States Artillery, and Lieutenant Maguire, New York Volunteer Engineers, both capable and efficient officers. The work that remained unfinished, and which was completed on the night of the 9th of July, was principally the clearing out

and révetting the embrasures, laying platforms for some of the mortars, building surgery and splinter-proofs, constructing a new road from the first to the second line, and, on the last night, to cut down the trees and brush which masked the batteries from the enemy.

So complete were the orders and arrangements of General Vogdes, that, notwithstanding large fatigue details of from three hundred to one thousand men were engaged in erecting and arming batteries mounting fifty guns,* only a few hundred yards distant from a watchful enemy, yet not the slightest thing occurred to awaken their suspicions.

During the action of the 10th of July I remained in the batteries, in charge of the engineer party, and directed the necessary repairs of embrasures, &c.

On the night of the 11th of July, under the orders of General Seymour, I built a line of rifle pits some twenty or thirty yards beyond the position afterwards occupied by the second parallel, in the approaches to Fort Wagner.

On the 13th, I placed two 30-pounder Parrott guns in position on the south bank of St. Vincent's Creek, near where a battery of 30-pounders was afterwards built.

On the 15th, I was directed to place five 10-inch siege mortars in position on the right and in front of the Beacon House. This was finished on the 16th, and that night the works in advance were placed under my charge. These works had been planned and almost finished by my predecessors, and it only remained for me to correct, as far as possible, some obvious defects. The details were worked to the best advantage until midnight on the 17th, when a very severe rain storm, which lasted until 8 or 9 A. M. on the 18th, compelled them to withdraw.

On the 27th of July, I was ordered by you to construct what were afterwards known as the "Left Breaching Batteries against Fort Sumter." Their site was on a sand ridge, its general direction making an angle of about 35°

* Forty-seven guns.

with the gorge of Fort Sumter, and distant about four thousand two hundred yards from that work. A marsh, covered with water at high tide, separated this from the firm ground to the right. A dam, eight feet thick, of sand piled against a centre wall of sand bags two feet thick, was built at the mouth of the stream that entered the marsh, which prevented the ingress of the tide, and allowed good, safe and durable roads being made, with but little labor, to the rear of the batteries.

On the 27th of July the interior crest of a sunken battery for five 100-pounder Parrott guns was laid out, with arrangements for one magazine to hold two hundred rounds per gun, and a traverse twelve feet thick on top, between each gun and the one adjacent.

The position being within range of the enemy's batteries on James Island, ground was broken at night, a detail of ten engineers and one hundred men being employed for this purpose. A small detail of ten engineers and fifty men were employed the next day, working as much as possible under cover, which, however, did not prevent the enemy shelling them.

July 29th a detail of fifty men worked all night, and on the 30th and 31st eighty and one hundred men respectively, for as the work progressed more men could be used with advantage and safety.

On July 31 the interior revetments of the 1st, 2d, 4th and 5th batteries were completed and the excavation for the magazine ready to receive the frames. Owing to a change of armament work was delayed from this time by your order. On the 4th of August I was ordered to finish the two batteries on the right for 200-pounder Parrott guns, and build a magazine for them. These were finished, August 7, having embrasures with oblique directrices, and a field of fire from a little to our left of Fort Sumter to Battery Bee on Sullivan's Island. and soon after one 200-pounder was mounted.

The details for this work from the 4th to the 7th of August inclusive were as follows:—Fifty on the 4th, one hundred on 5th, one hundred on the 6th in the day, and two hundred at night, and one hundred and fifty on the 7th, there being ten engineers with each fatigue party.

On August 8th you ordered me to prepare a battery for three additional 100-pounder Parrott guns, making the whole breaching battery consist of one 200-pounder and four 100-pounder Parrott guns. From this time forward a party of one hundred and fifty men worked during the day, and one of one hundred men at night, with the usual quota of engineer troops.

On the 12th of August you ordered that an elevated battery be prepared for the 10-inch rifle Parrott gun, or 300-pounder, which would be protected from James Island rebel batteries, and have full command of the channel from a little to our left of Fort Sumter seaward. All of the above batteries were completed and engaged in the reduction of Fort Sumter by the 17th of August. It should be remarked, however, that as soon as a gun could be used it commenced firing at once without waiting for the completion of the battery. The details were often obliged to suspend labor, during the very severe firing that the enemy directed against these batteries from James Island and Battery Gregg, although ordinarily their fire was unheeded. In addition to the construction of these batteries, the above details were engaged in repairing traverses, constructing new magazines for the seven 30-pounder battery on the right, in raising and strengthening the parapet, and making new embrasures for the 200-pounder gun battery in front of the latter, and in constructing and laying new platforms for the two 10-inch sea-coast mortars to the left and rear.

The batteries (except that of the 300-pounder) were full sunken. The line of each interior crest made an angle varying from 30° to 37° with the gorge of Fort Sumter, de-

pending upon the nature of the ridge at the different points. The width of each gun battery was eighteen feet, the traverse between being 12 feet thick at top. The interior revetments were of sand bags laid in the usual manner of headers and stretchers, and extended below the gun platform. The embrasures have oblique directrices, and were constructed at first to admit of firing only on Fort Sumter, but after its reduction the field of fire was increased to embrace Fort Johnson and Battery Gregg, and finally the James Island batteries and Fort Wagner. A revetment of raw hides soaked and tightly pinned down was first tried on one of the embrasures, and although on drying it was tight and apparently promised least resistance to the blast of the gun, it proved but a temporary and indifferent revetment for guns of this calibre. The gabion revetment was subsequently used in all the embrasures. The method of anchoring them was to lay a piece of 6-inch × 8-inch timber parallel to the cheek, and some three to four feet back, having two stout anchoring stakes six feet long driven on the inner side. Each gabion, besides being well picketed to the fascine upon which it rested, was tied to this timber by No. 10 wire, stoutly enough to withstand the blast, and yet to give way if struck by a shot, without destroying the entire embrasure.

The exterior slopes of the batteries were left in the rough, no attempt being made to finish them smoothly, by wasting labor that was sorely needed elsewhere. A coating of marsh mud, about one or two inches thick, was spread over the exterior slopes and on the tops of the magazines and traverses, which on drying became a hard crust, and prevented the sand from blowing into the faces of the gunners, and in the muzzles and other parts of the piece and carriage, a precaution amply appreciated by all who served in the batteries.

There were two magazines, one between Nos. 2 and 3 for the service of the two right pieces, and one on the left

of No. 5 for the service of the remaining three guns. The former was 10 feet×10 feet×6 feet high in the clear, with a filling room 4 feet×5 feet×6 feet high; the latter was 10 feet×15 feet×6 feet high, with one return gallery, 4 feet×6 feet high. The magazine frames were of 4-inch ×6-inch stuff, placed two feet six inches apart, and covered with 3-inch plank and eight feet of sand on the line of least resistance, and for sheeting 1-inch, 1¼-inch or 2-inch plank was used as could be procured.

Temporary platforms for the four 100-pounder guns were constructed by Sergeant Clark, New York Volunteer Engineers, which answered all requirements, and were uninjured at the close of the siege.

The 300-pounder Battery.—Having no experience to guide me in the construction of a battery for a gun of such a calibre, and knowing its value in the eyes of all, it is not surprising that every precaution was taken to guard it from every possible accident. Being also unaware of the effects of its discharge in reference to its disturbing influence on the ground in its immediate vicinity, and fearful that with such a mobile and shifting material as sand the ordinary revetments would not withstand its discharge, great precautions were taken to counteract every supposable effect. The dimensions of the battery were as follows:

Height of crest of parapet above tide mark,	20 feet.
Height of crest of parapet above platform of gun,	12 feet.
Height of barbette above platform,	5 feet.
Thickness of parapet at top,	18 feet.
do. of barbette at top,	25 feet.
Radius of epaulement at base,	12 feet
Interior slope,	3 upon 1
Distance of centre pintle from foot of interior slope,	7 ft. 3 in.

The interior revetment was first of sand bags two feet thick, against which one of marsh sods one foot thick was

built, which latter it was found made a good strong binding and durable revetment. The top of the battery was covered also with these sods, which, besides keeping the sand from blowing, also prevented the rain from washing it down. The single cheek of the embrasure was revetted with gabions, and the sole or barbette was laid with fascines, everything else tried being unable to withstand the powerful blast of the piece. For facility in loading, steps were arranged to lead to a box or trough in front of the muzzle, and sunk in the parapet, which permitted four men to stand while lifting the shell into the piece. In constructing the parapet the sand was thrown from the ditch to the parapet by relays forming terraces, which were afterwards left in that condition.

The magazine for this gun was ample for its service, being 10 feet × 15 feet × 6 feet high, and constructed like the others. A bomb proof for the signal and telegraph operators, eleven feet square, was built near this magazine shortly afterwards.

I must state that great credit is due Lieutenant McGuire, New York Volunteer Engineers, for his constant and unwearied attention to the work, and of whose long service and many practical and useful ideas I very often availed myself. I must mention also Sergeants Anyan and Clark, Company A of the same regiment, (the latter afterwards killed at Battery Gregg,) for unusual energy and intelligence in the discharge of their duties.

From this time until the 31st of August I was engaged in simply overlooking the condition of these batteries and seeing to the repairs and alterations required.

The following list contains all the engineering material expended in the construction and repair of the above batteries, and also in the repair of the 30-pounder batteries on their right, viz. :

16,700 Sandbags,
1,500 feet three-inch Plank,
3,000 feet two-inch Plank,
2,000 feet one-inch Plank,
85 iron Gabions,
45 Fascines, eighteen feet long,
6 kegs Nails and Spikes,
1 coil three-inch Rope,
1 coil Wire, (No. 10.)

The trenches and works on the right had been heretofore under charge of Captain Brooks, Assistant Engineer and A. D. C., and whom, by order of Captain Reese, United States Engineers, Assistant and Consulting Engineer, I relieved on the 1st of September. The sap had at that time reached about the middle of the long bayou just in rear of the marsh. My instructions were clear and explicit to push the sap rapidly as possible over the narrow neck of sand between the marsh and the beach—the probability of its failure being ignored by Captain Reese, to whose energy and decision its success is justly due.

The details of engineers and infantry remained unchanged, with but few exceptions. The following extracts from my daily reports will show the progress of the work.

September 2.—The trench was carried as far as the beach—a branch nearly at right angles being run, to be used by sharpshooters as a temporary flanking arrangement. Here, as heretofore, the sap-roller could not be used, because of the torpedoes planted by the rebels.

September 4.—A simple trench, making an angle of about seventy degrees with the last was commenced yesterday morning, and advanced fifteen yards up to 7 A. M. to-day. The work was delayed because of a heavy fire from the enemy immediately after dark. No sooner did we advance a few feet than a well-directed shell would send sand and sandbags in every direction, and cause us to commence anew. On the left of the 8-inch mortar bat-

tery in the fifth parallel, a battery of three 10-inch siege mortars was established last night. A position for the operation of the "calcium light" was prepared on the left of the second parallel. The light was used from 7½ P. M. till daybreak to-day. An extra detail of one hundred men was employed in widening and strengthening the approaches—all of which below the fifth parallel are now completed.

September 5.—The trench spoken of in my last report was carried to within twenty feet of the marsh, and is, altogether, twenty-five yards long. A new trench, at an angle of sixty degrees with the latter, was commenced last night. Yesterday morning the enemy opened so effective a fire of artillery on the head of the sap, as to stop its progress during the forenoon. One torpedo was removed, and four others can be seen near the foot of the slope of the preceding trench.

September 6.—Yesterday the land and naval batteries began the bombardment of Fort Wagner, and as it was supposed the danger would be too great, no fatigue parties were sent up in the trenches. Under orders of Captain Reese, I went to the front, and found that, owing to the extreme accuracy of our guns, the advance was the safest part of all the trenches. A temporary brigade of sappers was at once organized of four colored soldiers found in the fifth parallel, while an order was sent for the engineer detail. The work was pushed very rapidly, and by 11 P. M. one hundred and eighty yards in length of trench had been excavated, which was put in good condition by morning. The head of the sap at that time was not more than ten or twelve yards from the (our) right salient of Wagner. Some six or seven torpedoes were removed in the line of the sap, and no accidents occurred. At noon the leading sapper cut into the decayed bodies of the Union soldiers who fell on the 18th of July, and who were buried by the rebels in pits, in front of Fort Wagner.

September 7.—Yesterday morning I was relieved by Captain Brooks, who reported for duty. But last night I was desired to take charge during the night again. The sap was pushed very rapidly, one branch, under Captain Walker, to the ditch, and the other, and most important, to the right as far as the sea-flank of the fort, which was reached at about 2 A. M. to-day. The evacuation becoming known, labor was discontinued, and the parties sent to camp. It is proper to mention here the fine behavior of the working parties, alike commendable when, under the severest fire, they displayed the coolness of veterans, and when under the disagreeable necessity of uncovering the graves of their comrades to reach the goal for which so much had been expended.

I am, general, very respectfully, your obedient servant,

PETER S. MICHIE,

First Lieut. U. S. Engrs. and Asst. Engr. Dept. South.

APPENDIX F.

REPORT OF COMMANDER FOXHALL A. PARKER.

CAMP EDGEWOOD,
MORRIS ISLAND, S. C., August 23, 1863.

SIR,—I have the honor to report to you that, agreeably to instructions from General Gillmore, the naval battery under my command opened upon Fort Sumter with two 8-inch Parrott and two 80-pounder Whitworth guns, upon the 17th instant, since which period we have been engaged from daylight to dusk of each day up to the present time.

The whole number of Parrott shells expended amounts to seven hundred and three; of which three hundred and seventy-three struck the fort, two hundred and fifty-two fell short or went over it, and seventy-eight "tumbled."

From the Whitworth guns two hundred and twenty-two solid projectiles were fired; of which ninety-eight hit and one hundred and twenty-four missed the fort.

Upon the 19th instant, one of the Whitworths was entirely disabled, by the reinforce bands starting forward, and upon the 21st I discontinued firing from the other, as the shot were continually jamming in the bore, in ramming home one of which four men were killed by a premature explosion of the charge.

Although shot and shell were constantly passing over and around us, through the mercy of God they harmed us not.

The officers and men under my command have done their whole duty to the country and to the navy, and to

day, as a reward of their labors, have the proud satisfaction of beholding Fort Sumter a shapeless mass of ruins, with its last gun dismounted and fallen among the *débris*.

FOXHALL A. PARKER,
United States Navy.

Admiral DAHLGREN,
Commanding South Atlantic Blockading Squadron.

APPENDIX G.

CORRESPONDENCE BETWEEN

GEN. BEAUREGARD AND MAJ.-GEN. GILLMORE.

HEADQUARTERS DEPARTMENT OF THE SOUTH,
MORRIS ISLAND, S. C., August 21, 1863.

General G. T. BEAUREGARD,

Commanding Confed. Forces about Charleston, S. C.:

GENERAL,—I have the honor to demand of you the immediate evacuation of Morris Island and Fort Sumter by the Confederate forces.

The present condition of Fort Sumter, and the rapid and progressive destruction which it is undergoing from my batteries, seem to render its complete demolition within a few hours a matter of certainty. All my heaviest guns have not yet opened. Should you refuse compliance with this demand, or should I receive no reply thereto within four hours after it is delivered into the hands of your subordinate at Fort Wagner for transmission, I shall open fire on the city of Charleston, from batteries already established within easy and effective range of the heart of the city.

I am, General, your obedient servant,

Q. A. GILLMORE,
Brigadier-General Commanding.

HEADQUARTERS OF SOUTH CAROLINA, GEORGIA AND FLORIDA
CHARLESTON, S. C., August 22d, 1863.

SIR,—Last night, at fifteen minutes before eleven o'clock, during my absence on a reconnoissance of my fortifications,

a communication was received at these headquarters, dated "Headquarters, Department of the South, Morris Island, S. C., August 21, 1863," demanding the immediate evacuation of Morris Island and Fort Sumter by the Confederate forces, on the alleged ground that "the present condition of Fort Sumter, and the rapid and progressive destruction which it is undergoing from my batteries, seem to render its complete destruction within a few hours a matter of certainty," and if this letter was not complied with, or no reply thereto was received, within four hours after it was delivered into the hands of my subordinate commander at Fort Wagner for transmission, a fire would be opened on the city of Charleston from batteries already established within easy and effective range of the heart of the city. This communication to my address was without signature, and of course returned. About half-past one o'clock one of your batteries did actually open fire and throw a number of heavy shells into the city, the inhabitants of which of course were asleep and unwarned.

About nine o'clock the next morning, the communication alluded to was returned to these headquarters, bearing your recognized official signature, and it can now be noticed as your deliberate official act. Among nations not barbarous, the usages of war prescribe that where a city is about to be attacked, timely notice shall be given by the attacking commander, in order that non-combatants shall have an opportunity of withdrawing beyond its limits. Generally the time allowed is from one to three days; that is, time for the withdrawal in good faith of at least the women and children. You, sir, gave only four hours, knowing that your notice, under existing circumstances, could not reach me in less than two hours, and not less than the same time would be required for an answer to be conveyed from this city to Battery Wagner.

With this knowledge, you threaten to open fire on this city, not to oblige its surrender, but to force me to evacu-

ate those works which you, assisted by a great naval force, have been attacking in vain for more than forty days. Batteries Wagner and Gregg and Fort Sumter are nearly due north from your batteries on Morris Island, and in distance therefrom ranging from half a mile to two and a quarter miles. This city, on the other hand, is to the northwest, and quite five miles distant from the battery which opened against it this morning. It would appear, sir, that, despairing of reducing these works, you now resort to the novel measure of turning your guns against the old men, the women and children, and the hospitals of a sleeping city—an act of inexcusable barbarity, from your own confessed point of sight, inasmuch as you allege that the complete demolition of Fort Sumter within a few hours by your guns seems a matter of certainty. Your omission to attach your signature to such a grave paper must show the recklessness of the course upon which you have adventured. While the facts that you knowingly fixed a limit for receiving an answer to your demand, which made it almost beyond the possibility of receiving any reply within that time, and that you actually did open one, and throw a number of the most destructive missiles ever used in war into the midst of a city, taken unawares and filled with sleeping women and children, will give you a bad eminence in history—even in the history of this war. I am only surprised, sir, at the limits you have set to your demand. If, in order to obtain the abandonment of Morris Island and Fort Sumter, you feel authorized to fire on this city, why did you not include the works on Sullivan's and James Islands, nay, even the city of Charleston, in the same demand? Since you have felt warranted in inaugurating this method of reducing batteries in your immediate front which were otherwise found to be impregnable, and a mode of warfare which I confidently declare to be atrocious and unworthy of any soldier, I now solemnly warn you that if you fire again on

this city from your Morris Island batteries, without giving a somewhat more reasonable time to remove the non-combatants, I shall feel impelled to employ such stringent means of retaliation as may be available during the continuance of this attack. Finally, I reply that neither the works on Morris Island nor Fort Sumter will be evacuated on the demand you have been pleased to make. Already, however, I am taking measures to remove all non-combatants, who are now fully aware and alive to what they may expect at your hands.

Respectfully, your obedient servant,

G. T. BEAUREGARD, *General Commanding.*

To Brigadier-General Q. A. GILLMORE,
Commanding U. S. Forces, Morris Island.

HEADQUARTERS DEPARTMENT OF THE SOUTH,
MORRIS ISLAND, S. C., August 22, 1864—9 P. M.

General G. T. BEAUREGARD,
Commanding Confederate Forces, Charleston, S. C.:

SIR,—I have the honor to acknowledge the receipt of your communication of this date, complaining that one of my batteries has opened upon the city of Charleston and thrown "a number of heavy rifled shells into the city, the inhabitants of which, of course, were asleep and unwarned."

My letter to you demanding the surrender of Fort Sumter and Morris Island, and threatening, in default thereof, to open fire upon Charleston, was delivered near Fort Wagner at 11:15 o'clock A. M. on the 21st instant, and should have arrived at your headquarters in time to have permitted your answer to reach me within the limit assigned, viz., four hours. The fact that you were absent from your headquarters at the time of its arrival, may be regarded as an unfortunate circumstance for the city of Charleston, but is one for which I, clearly, am not responsible. This letter bore date at my headquarters, and was officially delivered by an officer of my staff.

The inadvertent omission of my signature, doubtless affords ground for special pleading, but it is not the argument of a commander, solicitous only for the safety of sleeping women and children and unarmed men. Your threats of retaliation for acts of mine, which you do not allege to be in violation of the usages of civilized warfare, except as regards the length of time allowed as notice of my intentions, are passed by without comment. I will, however, call your attention to the well-established principle, that the commander of a place attacked, but not invested, having its avenues of escape open and practicable, has no right to expect any notice of an intended bombardment, other than that which is given by the threatening attitude of his adversary. Even had this letter not been written, the city of Charleston has had, according to your own computation, forty days' notice of her danger.

During that time my attack on her defences has steadily progressed; the ultimate object of that attack has at no time been doubtful. If, under the circumstances, the life of a single non-combatant is exposed to peril by the bombardment of the city, the responsibility rests with those who have first failed to remove the non-combatants or secure the safety of the city, after having held control of all its approaches for a period of nearly two years and a half, in the presence of a threatening force, and who afterwards refused to accept the terms upon which the bombardment might have been postponed.

From various sources, official and otherwise, I am led to believe that most of the women and children of Charleston were long since removed from the city, but upon your assurance that the city is still "full" of them, I shall suspend the bombardment until 11 o'clock P. M. to-morrow, thus giving you two days from the time you acknowledge to have received my communication of the 21st instant.

Very respectfully your obedient servant,

Q. A. GILLMORE, *Brigadier-General Commanding.*

APPENDIX H.

CORRESPONDENCE BETWEEN

REAR-ADM. DAHLGREN AND GEN. GILLMORE.

HEADQUARTERS DEPARTMENT OF THE SOUTH,
MORRIS ISLAND, S. C., August 3, 1863.

Rear-Admiral DAHLGREN, *Comd'g S. A. B. Squadron.*

ADMIRAL,—I am more and more convinced that we can practically invest this island, or at least keep all steamers away from Cummings Point. Last night, my look-out boat lay within four hundred yards of Cummings Point until 11 P. M., and then moved in a northerly direction, and remained within about one thousand yards of Fort Sumter (due west) until three o'clock this morning. Nothing visited Cummings Point during the night, except three row boats. A large steamer anchored abreast of Fort Sumter just after dark, and remained there until just before daybreak, and then moved toward the city. I have made the same arrangements for to-night that were in force last night. I have no howitzer boats. Could you not prevent the small boats reaching Cummings Point with your boat howitzers?

Very respectfully, your obedient servant,

Q. A. GILLMORE, *Brig.-Gen. Comd'g.*

FLAG STEAMER DINSMORE,
OFF MORRIS ISLAND, Aug. 4, 1863.

GENERAL,—Yours of the 3d has been received.

In order that the object of it may be better attained, it will be advisable that the officer who observes for you inside of Cummings Point should communicate how the

boats, &c., should operate, when the signal is made, and in what direction.

If you will direct him to see me, there will be no difficulty in making the desired arrangements.

I am, very respectfully, your obedient servant,

JNO. A. DAHLGREN,
Rear-Admiral Comd'g S. A. B. Squadron.

Brig.-Gen. Q. A. GILLMORE, U. S. A., *Com. Dep. South.*

HEADQUARTERS DEPARTMENT OF THE SOUTH,
MORRIS ISLAND, S. C., August 5, 1863.

Admiral DAHLGREN,
Comd'g S. A. B. Squadron, off Charleston, S. C.

ADMIRAL,—In reference to the probability of our being able to cut off, or seriously interfere with, the enemy's supplies of men and provisions on this island, I would say that a calcium light has been ordered from New York, and ought to reach here in the Fulton in about eight days from this time. With it I expect to be able to illuminate Cummings Point, so that my batteries and your boats can see it distinctly, and be themselves in deep darkness. I hope and believe that we can effect satisfactory results with it. I inclose a letter from Assistant Surgeon Luck, United States Navy, which I supposed had been sent some days ago. Very respectfully, your obedient servant,

Q. A. GILLMORE, *Brig.-Gen. Comd'g.*

(By signals.)

MORRIS ISLAND, August 16, 1863—6.30 P. M.

ADMIRAL DAHLGREN,—I shall open on Sumter at daylight. Can you commence on Wagner as early as that?

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 16, 1863—9.20 P. M.

GENERAL GILLMORE,—The monitors will commence to move at six, and will open soon after.

If it is an object to you, I will open fire earlier; but the tide is very bad before six o'clock for the monitors.

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 16, 1863—9.50 P. M.

ADMIRAL DAHLGREN,—If I find the fire from Wagner too hot, I will stop firing from my advance batteries until you get the monitors into action against Wagner.

My left batteries can be served in spite of Wagner.

General GILLMORE.

(By signals.)

MORRIS ISLAND, August 17, 1863—1.15 P. M.

ADMIRAL DAHLGREN,—What do you think of the morning's work?

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 17, 1863—1.40 P. M.

GENERAL GILLMORE,—Sumter seems greatly damaged. What do you think?

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 17, 1863—2 P. M.

ADMIRAL DAHLGREN,—Are your monitors out of action for the day, or will they go in again soon?

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 17, 1863—2.15 P. M.

GENERAL GILLMORE,—If Wagner opens and disturbs you, the monitors will run up and silence her again, as that is what I understand you wish.

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 17, 1863—2.30 P. M.

ADMIRAL DAHLGREN,—One of my officers reports the enemy mounting a heavy gun on the sea face of Fort Wagner.

General GILLMORE.

(By signals. Answer to dispatch of 1.40 P. M.)

MORRIS ISLAND, August 17, 1863—2.50 P. M.

ADMIRAL DAHLGREN,—I am satisfied with the firing thus far. The gorge wall is covered with shot holes.

General GILLMORE.

(By signals.)

MORRIS ISLAND, August 17, 1863—10.50 P. M.

ADMIRAL DAHLGREN,—If the enemy expect to save Sumter, they will try a sortie from Wagner in the morning. Can you get any monitors in quite early? For general operations, I propose the same programme for to-morrow that we had to-day. General GILLMORE.

(By signals.)

MORRIS ISLAND, August 19, 1863.

ADMIRAL DAHLGREN,—I am now pushing my approaches to Fort Wagner, and need cover against sorties. I think I can destroy the traverses, and dismount the heavy gun on the sea front of Wagner, with the assistance of a powerful fire from the New Ironsides. If that big gun were out of the way, could a couple of monitors lie within four or five hundred yards of Wagner all the time, night and day? A deserter says there are at least twenty quaker guns on the parapet of Sumter.

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 19, 1863—3.45 P. M.

GENERAL GILLMORE,—I am going in with the monitors to feel of Sumter. If the enemy's fire is heavy please let your batteries in action. ADMIRAL DAHLGREN.

(By signals.)

MORRIS ISLAND, August 19, 1863.

ADMIRAL DAHLGREN,—All right. It shall be done.

General GILLMORE.

(By signals.)

MORRIS ISLAND, August 21, 1863—1.5 P. M.

ADMIRAL DAHLGREN,—The fire of Fort Wagner is very galling. Can't your monitors keep it down?

General GILLMORE.

(By signals.)

MORRIS ISLAND, August 21, 1863—2.30 P. M.

ADMIRAL DAHLGREN,—My approaches are suspended on account of the sharpshooters on Fort Wagner. Can you keep down that fire? General GILLMORE.

(By signals.)

MORRIS ISLAND, August 21, 1863—3.15 P. M.

ADMIRAL DAHLGREN,—I am going to send all the newspaper reporters to Hilton and keep them there. Will you do the same with those you have in the fleet? Please stop the Cambria and City of Richmond, now going out, and order them to wait further orders. General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 21, 1863—3.50 P. M.

GENERAL GILLMORE,—It will be difficult to do so, as one of them is the U. S. Mail Agent, and sent here by the Navy Department. I have sent the gun-boats up and will urge the Ironsides in if possible. Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 21, 1863—10.45 A. M.

ADMIRAL DAHLGREN,—The enemy's sharpshooters are annoying our advanced batteries seriously. Can you have it stopped. General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 21, 1863—10.55 A. M.

GENERAL GILLMORE,—I will try to do so.

Admiral DAHLGREN.

(By signals.)

OFF MORRIS ISLAND, August 21, 1863—10 P. M.

GENERAL GILLMORE,—I am going in with the iron clads

to Sumter and shall open about 11½ o'clock. Please give the necessary directions in order that I may not be fired into. Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 21, 1863—10.5 P. M.

ADMIRAL DAHLGREN,—I will see to it.

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 22, 1863—3.40 A. M.

GENERAL GILLMORE,*—I have just returned from above. The Passaic, which was some distance in advance, got ashore. It took so much time to get her off that when I was informed of the fact I would have had but little time to make the attack before daylight. So it was unavoidably postponed for to-night. Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 22, 1863—8 A. M.

ADMIRAL DAHLGREN,—I received your dispatch stating that your attack is postponed until to-night. I think, with our batteries in operation against Sumter, she can't fire a gun at you even in the day time, if she has any to fire, which I doubt. General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 22, 1863—8.50 A. M.

GENERAL GILLMORE,—It is not of Sumter that I am apprehensive, but of Moultrie and adjacent forts; most all of Sumter's guns have been sent to Moultrie, which makes no difference in the fire. This I am inclined to endure rather than have a monitor ashore to defend or destroy, which would change the whole course of operations.

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 22, 1863—9.40 A. M.

ADMIRAL DAHLGREN,—Wagner is firing very rapidly.

* The substance of this dispatch was also communicated in a letter of same date.

There is great danger of dismounting our guns. What can you do to stop it? General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 22, 1863—9.50 A. M.

GENERAL GILLMORE,—I will send up some monitors at once. Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 22, 1863—10 A. M.

ADMIRAL DAHLGREN,—Thank you. Colonel Turner just signals from the battery that our two heavy guns in front will be dismounted, unless the navy come in.

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 22, 1863—10.10 A. M.

GENERAL GILLMORE,—The order is given, and the monitors are going up. Admiral DAHLGREN.

(By signals.)

OFF MORRIS ISLAND, August 22, 1863—1.5 P. M.

GENERAL GILLMORE,—Is the fire of the iron-clads effectual in silencing the sharpshooters at Fort Wagner?

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 22, 1863—2.35 P. M.

ADMIRAL DAHLGREN,—Between the gunboats and our batteries, Wagner's fire has been considerably kept under. General GILLMORE.

(By signals.)

MORRIS ISLAND, August 22, 1863—8.45 P. M.

ADMIRAL DAHLGREN,—Are you going to attack to-night? General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 22, 1863—8.55 P. M.

GENERAL GILLMORE,—Yes, if the weather will permit. I have sent some communications, received by flag of truce, for you.

I have issued an order that no more flags will be received by the fleet in any but Sullivan's Island Channel, unless you desire to communicate in this one.

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 23, 1863.

ADMIRAL DAHLGREN,—What did you ascertain as to the condition of Sumter?

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 23, 1863—10 A. M.

GENERAL GILLMORE,—It was so foggy, that but little could be ascertained. We received a very heavy fire from Moultrie. The Admiral is now asleep.

C. BADGER, *Chief of Staff.*

(By signals.)

MORRIS ISLAND, August 23, 1863—10.20 A. M.

CAPTAIN BADGER,—Did you receive any fire from Fort Sumter?

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 23, 1863—10.25 A. M.

GENERAL GILLMORE,—She fired two or three times only, when we first opened.

Captain BADGER.

HEADQUARTERS DEPARTMENT OF THE SOUTH,
MORRIS ISLAND, S. C., August 23, 1863.

Rear-Admiral JOHN A. DAHLGREN,

Comd'g S. A. B. Squad., off Morris Island, S. C.:

MY DEAR SIR,—I am in receipt of your letter of yesterday, informing me that your contemplated attack on Fort Sumter, the night before, was postponed in consequence of the grounding of the Passaic.

I agree with you, that the guns of the monitors should not be expended unnecessarily on Wagner, but kept for the interior defences of Charleston. I have entertained these views all along, and expressed them to you in my letter of the 21st instant.

I consider the offensive power of Sumter entirely destroyed from to-day's firing. I do not believe they can serve a single gun. The gorge wall is breached throughout its entire length, the débris in several places forming a practicable ramp from the level of the water to the top of the ruins. Many of our shot go through and through both walls, and plunge into the water beyond. Some of the guns from the gorge and the adjacent face, looking towards Cummings Point, were doubtless removed to James and Sullivan's Islands, before the bombardment commenced, or during its progress. Advantage may be taken of the darkness now, to remove those that have been dismounted on the other faces.

I desire to call attention to the project frequently discussed, and deemed practicable by us both, of investing Morris Island, as soon as Sumter should be rendered harmless, and starving the enemy into terms. I think that I can close communication on my left, as far out as to include Lighthouse Creek. Cannot picket boats be managed between the mouth of that creek and your monitors, so as to complete the investment? This investment ought not, of course, to interfere with your active offensive operations.

If the wind goes down, I will come out and see you to-day. Very respectfully, your obedient servant,

Q. A. GILLMORE, *Brig.-Gen. Comd'g.*

(By signals.)

OFF MORRIS ISLAND, August 26, 1863—11.10 A. M.

GENERAL GILLMORE,—Would it be convenient for you to open a heavy fire on Sumter, sustaining it until nightfall?

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 26, 1863—11.30 A. M.

ADMIRAL DAHLGREN,—I can open a pretty strong fire on Sumter, if you deem it necessary. One of my 8-inch guns is bursted, and others are nearly expended. Do you

think Sumter has any serviceable guns? My calcium light can operate to-night on Sumter and the harbor, unless you wish otherwise, and we can arrange for investing Morris Island. General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 26, 1863—12.15 P. M.

GENERAL GILLMORE,—I am going to operate on the obstructions, and a portion of my men will be without cover. I do not fear heavy guns from Sumter, but wish to keep down the fire of small guns. Your fire will help me very much. I am sorry that your guns are giving out.

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 26, 1863—12.50 P. M.

COLONEL TURNER, *Chief of Artillery*,—Open all the guns in the left batteries, on Sumter, and keep them going through the day. General GILLMORE.

HEADQUARTERS DEPARTMENT OF THE SOUTH,
MORRIS ISLAND, S. C., August 26, 1863.

Rear-Admiral J. A. DAHLGREN,

Comd'g S. A. B. S., off Morris Island, S. C.:

MY DEAR SIR,—I shall be able, I think, to light up the waters between Fort Sumter and Cummings Point, so that no small boats can approach the latter without being seen by your picket boats. My plan is to locate the lights at the left of my second parallel, and throw a cone of rays subtending an angle of 15° to 20°, the right or easterly element of which will pass through Cummings Point and include Fort Sumter. Will this interfere with your plan of operations for to-night? If so, please inform me by the bearer, Lieutenant Bragg, of my staff.

Very respectfully, your obedient servant,

Q. A. GILLMORE, *Brig.-Gen. Comd'g.*

(By signals.)

MORRIS ISLAND, August 24, 1863—9.30 A. M.

ADMIRAL DAHLGREN,—Can I take from your vessel

another 8-inch gun and a 100-pounder? I have burst three 8-inch guns in all. We took sixty-eight prisoners, including two officers, and gained one hundred yards toward Wagner yesterday. General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 27, 1863—9.55 A. M.

GENERAL GILLMORE,—You can take the guns with pleasure. My attempt to pass the forts last night was frustrated by the bad weather, but chiefly by the setting in of a strong flood tide. Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 27, 1863—1.30 P. M.

ADMIRAL DAHLGREN,—Thanks for the guns. Have you any plans that would render it inexpedient for me to throw a strong calcium light on Sumter and Cummings Point to-night? Prisoners say that reinforcements and supplies are brought over in small boats from Sumter to Cummings Point at night. General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 27, 1863—7.55 P. M.

GENERAL GILLMORE,—Not being able to complete my arrangements I shall not move up to-night. If you wish to use your calcium lights it will not inconvenience me.

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 28, 1863—4.15 P. M.

ADMIRAL DAHLGREN,—Will your plans for to-night render it inadvisable for me to light up Cummings Point and Sumter? It was too late last night for me to do so, after I ascertained there was no objection to its being done.

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 28, 1863—4.40 P. M.

GENERAL GILLMORE,—I have no objection, but the contrary. My chief pilot informs me a gale is coming on, and I am coming into the creek. Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 29, 1863—3.55 P. M.

ADMIRAL DAHLGREN,—Have you any operations on foot in which I can aid you in any way? Will you be on board your ship between 6 and 7 this evening?

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 29, 1863—4.10 P. M.

GENERAL GILLMORE,—Thank you. I shall move up again with the monitors to-night. I shall be most happy to see you on board between 6 and 7 this evening. I shall start soon after that. Admiral DAHLGREN.

(By signals.)

OFF MORRIS ISLAND, August 29, 1863—9 P. M.

GENERAL GILLMORE,—My movement is postponed. It has just been reported to me that Sumter has fired several shots to-day, and operations were based on the supposition that Sumter was silenced.

The enemy have also been at work on the obstructions during the day. The chief pilot reports that the line of obstructions have been added to, making a line entirely across the channel, from above Sumter to Moultrie. The fire of Moultrie will be as much as I can attend to. I would ask if you cannot keep up a fire to-morrow on Sumter in order to completely dismantle her.

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 29, 1863—9.45 P. M.

ADMIRAL DAHLGREN,—Sumter has not fired a shot to-day. My look-out, who has been on the watch all day, is positive on this point. His attention was specially directed to this matter.

It is the concurrent testimony of prisoners, deserters and contrabands, that Sumter was once effectually silenced. Nothing can prevent her remounting guns during the night, and she may have done so; but none have been fired to-day. General GILLMORE.

(By signals.)

MORRIS ISLAND, August 28, 1863—10.40 P. M.

ADMIRAL DAHLGREN,—The officer commanding the trenches, who kept several men on the look-out all day, in order to warn his men to cover whenever a gun is fired, says Sumter has not fired to-day. I will open a fire to-morrow, as you request. General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 29, 1863—11 P. M.

GENERAL GILLMORE,—My chief pilot, who was up the harbor to-day, reports that he saw guns mounted on Sumter, and that they were fired. Your look-out may be correct, but if he is in error, it would be fatal to my plans. I can cover my men while working on the obstructions, from one side, but not from both. If you do not object, I would therefore suggest that the fire of your batteries be resumed on Sumter with full vigor to-morrow, as a proper precaution. Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 29, 1863—11.30 P. M.

ADMIRAL DAHLGREN,—Can you spare me some 200-pounder shells? My supply is very low. A constant fire on Sumter is more than my guns can stand very long. I have lost three 200-pounders. General GILLMORE.

(By signals. Answer to dispatch of 10.40 P. M.)

OFF MORRIS ISLAND, August 29, 1863—11.35 P. M.

GENERAL GILLMORE,—Much obliged. All your fire on Sumter materially lessens the great risk I incur.

Admiral DAHLGREN.

(By signals.)

OFF MORRIS ISLAND, August 29, 1863—11.50 P. M.

GENERAL GILLMORE,—I will let you have either guns or projectiles, as many as you wish, if you will inform me how much you require. Admiral DAHLGREN.

(By signals.)

OFF MORRIS ISLAND, August 30, 1863—8.45 P. M.

GENERAL GILLMORE,—It is so rough that I shall not

move up with the monitors to-night. Your lighting up Cummings Point with your calcium lights will not interfere with my movements. Is it true that the enemy is strengthening Cummings Point? Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 31, 1863—8 A. M.

ADMIRAL DAHLGREN,—I have no information that Cummings Point is being strengthened by the enemy. We dismounted their heavy gun, looking towards Wagner, three days ago. General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, August 31, 1863—7 P. M.

GENERAL GILLMORE,—I understand from my chief pilot that you will be able, day after to-morrow, to open and sustain a heavy fire on Sumter. I shall therefore postpone, at least for to-night, an intended movement.

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, August 31, 1863—10 P. M.

ADMIRAL DAHLGREN,—I regret that any verbal report from your chief pilot has caused the postponement of any intended movement, when time is of such great value to the enemy in increasing the batteries on Sullivan's Island. Sumter did not fire on the monitors, while they were in range, to-day. I will open on Sumter to-morrow with five heavy guns, including two in the Naval Battery.

The Whitworth guns are of no use, and can be taken away. General GILLMORE.

(By signals.)

MORRIS ISLAND, September 1, 1863—11.45 A. M.

GENERAL GILLMORE,—We have dismounted two guns on Sumter, and injured one, this A. M. But two remain. We are firing with great accuracy. LOOK-OUT.

(By signals.)

OFF MORRIS ISLAND, September 1, 1863—12.15 P. M.

GENERAL GILLMORE,—I am glad the batteries are doing

good execution. I hope you will give me the full benefit of your fire, as I intend to be in action to-night, if nothing prevents. I would advise great care in handling the hand grenades, as one of my men was killed and two wounded by a very ordinary accident. Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, September 1, 1863—1.40 P. M.

ADMIRAL DAHLGREN,—I have ordered all the heavy guns to operate on Sumter until dark. Many of them are considered unsafe, and must be fired with a slow match. My look-out reports the firing to-day as remarkably accurate. General GILLMORE.

(By signals.)

MORRIS ISLAND, September 1, 1863—4.15 P. M.

ADMIRAL DAHLGREN,—I will see what the "Nellie Brown" has that I want. Colonel Turner reports the artillery fire on Sumter to-day more accurate and destructive than ever. General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, September 1, 1863—5.20 P. M.

GENERAL GILLMORE,—I am glad to learn of the accuracy of your fire. I shall go up with the monitors to-night. Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, September 2, 1863—8.10 A. M.

ADMIRAL DAHLGREN,—Do you desire a fire on Sumter to-day? General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, September 2, 1863—8.40 A. M.

GENERAL GILLMORE,—I think your fire on Sumter may be omitted to-day. Have just returned from above, and am trying to get a little rest. I do not know what damage our fire did Sumter. My chief-of-staff wounded, his leg broken. Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, September 2, 1863—11.35 A. M.

W. ADAMS, *Signal officer, Flag-ship:*

I wish to know if Sumter fired at the monitors last night while they were in action. Do not disturb the Admiral if he is asleep, but please get me the information as it will determine whether I continue firing on Sumter to-day.

General GILLMORE.

(By signals. Answer to above.)

OFF MORRIS ISLAND, September 2, 1863—11.45 A. M.

GENERAL GILLMORE,—Not to my knowledge. 222.

HEADQUARTERS DEPARTMENT OF THE SOUTH,
MORRIS ISLAND, S. C., September 3, 1863.

Rear-Admiral JOHN A. DAHLGREN,
Commanding S. A. B. Squadron:

DEAR SIR,—In reply to your letter of this date, offering the services of the iron clads to maintain a steady fire on Fort Wagner when I should be ready to move, I would say I should be very thankful for this co-operation, and hope to be ready to avail myself of it very shortly.

Colonel Turner, my chief of staff, has gone on board your flag-ship with a memorandum setting forth briefly the plan of operations which I propose for your approval. The cutting off of the enemy's communications with this island forms an important element in this plan, and I hope it may commence to-night.

Very respectfully, your obedient servant,

Q. A. GILLMORE, *Brig.-Gen. Comd'g.*

(By signals.)

OFF MORRIS ISLAND, September 5, 1863—4.50 A. M.

GENERAL GILLMORE,—Shall the "Ironsides" then begin the attack as was agreed upon. Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, September 5, 1863—5.5 A. M.

ADMIRAL DAHLGREN,—Yes; let her begin in the morning. She should fire well to the right so as to avoid our trenches. General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, September 5, 1863—6.10 A. M.

GENERAL GILLMORE,—Please have your extreme advance marked by an American flag, and if the fire of the Ironsides injures the trenches have a white flag waved over the American flag. Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, September 5, 1863—10.10 A. M.

LIEUTENANT PRESTON, *Flag-officer:*

I propose another trial to-night. The failure last night was owing to Mr. Higginson's acting without orders. My troops, when they passed down to the mouth of the creek, met him returning with a captured boat. Musketry had been resorted to in making the capture, and Cummings Point was alarmed.* General GILLMORE.

(By signals.)

MORRIS ISLAND, September 5, 1863—1.50 P. M.

ADMIRAL DAHLGREN,—I shall try Cummings Point to-night, and want the sailors again early. Will you please send in two or three monitors just before dark, to open on Moultrie as a diversion. The last time they were in they stopped reinforcements, and may do so to-night.

I don't want any fire in the rear. Please answer immediately. General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, September 5, 1863—2.30 P. M.

GENERAL GILLMORE,—As your request is at variance with the written programme, I have sent Lieutenant Preston ashore to see you on the subject. Admiral DAHLGREN.

(By signals.)

OFF MORRIS ISLAND, September 3, 1863—5.30 P. M.

GENERAL GILLMORE,—At what time this P. M. can you dispense with the Ironsides' fire? Admiral DAHLGREN.

* The above dispatch has reference to an attempted assault of Battery Gregg, from small boats, on the night of the 4th. The object was to spike the guns and blow up the magazine.

(By signals.)

MORRIS ISLAND, September 5, 1863—5.45 P. M.

ADMIRAL DAHLGREN,—Let her cease now. If we don't succeed to-night, I suppose she will open again at sunrise. If we do succeed, a red light will be shown from the water near Gregg. In that case, I expect a monitor in on to-morrow's high tide. General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, September 5, 1863—6.50 P. M.

GENERAL GILLMORE,—The Ironsides will resume fire at sunrise, unless a red light is shown by you at Gregg. High water to-morrow at 2 P. M., when an effort will be made to put a monitor close up to Gregg.

Admiral DAHLGREN.

(By signals.)

OFF MORRIS ISLAND, September 5, 1863—8.30 P. M.

GENERAL GILLMORE,—If you show a red light to-night, do you want a monitor to move up near Gregg at 2 A. M. or 2 P. M. to-morrow? Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, September 5, 1863—9 P. M.

ADMIRAL DAHLGREN,—No red light will be shown to-night. By arrangement with Mr. Preston, two monitors were to go in as a diversion to keep off any reinforcements, while my party is at work on Gregg.

The monitors need not remain after one o'clock.

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, September 5, 1863—10 P. M.

GENERAL GILLMORE,—There are two monitors up now near Sumter, with orders to fire to the right and left of it, by way of a diversion. If you wish it, I will send more up. I will send them orders to retire at one o'clock.

Admiral DAHLGREN.

HEADQUARTERS DEPARTMENT OF THE SOUTH,
MORRIS ISLAND, S. C., September 5, 1863.

Rear-Admiral J. A. DAHLGREN,
Comd'g S. A. B. Squadron, off Charleston, S. C.

DEAR SIR,—There is no change in the programme for to-night, except so far as the monitors firing on Gregg is concerned. The idea is, that while we are assaulting Gregg, no reinforcements shall be approaching in our rear, and no firing shall take place in that direction, and that the monitors shall remain in (in pairs) and cut off communication with Cummings Point, directing their fire on Moultrie or Sumter.

The programme for to-morrow to commence the same as to-day, *i. e.*, the New Ironsides to engage Wagner at sunrise. Unless there are strong reasons to the contrary, Wagner will be assaulted to-morrow.

Very respectfully, your obedient servant,
Q. A. GILLMORE, *Brig.-Gen. Comd'g.*

(By signals.)

OFF MORRIS ISLAND, September 6, 1863—7.35 A. M.

GENERAL GILLMORE,—Do you want the fire of all the monitors on Gregg and Wagner this morning? Do you propose to assault at low tide? Did you succeed last night? Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, September 6, 1863—8.30 A. M.

ADMIRAL DAHLGREN,—We found the enemy prepared at Cummings Point, and failed. I do not want the monitors' fire at all. I would like a slow fire from the Ironsides on Wagner. We are breaching the bomb-proof, and will not assault at this low tide. General GILLMORE.

(By signals.)

MORRIS ISLAND, September 6, 1863—1.35 P. M.

ADMIRAL DAHLGREN,—Our approaches have reached the ditch of Fort Wagner. Will you please have the Ironsides keep up a slow but steady fire on Wagner

through the day. I will write you more fully in regard to the plans, or see you myself this afternoon.

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, September 6, 1863—9 P. M.

GENERAL GILLMORE,—The mode of signals for stopping our fire at the moment of assault, to-morrow morning about nine o'clock, is liable to uncertainty. I would suggest therefrom, that the moment the Ironsides begins very rapid fire, say at about half after eight o'clock, she shall hoist a red flag, and when the half hour of rapid fire shall cease, this flag shall be handed down, which will indicate the entire cessation of her fire. The fire of all the monitors is to cease when a red flag is hauled down on the mast, unless directed against reinforcements coming up from Gregg to assist the enemy.

The attention of commanding officers is particularly called to the delicate exertions required of them at this important moment.

Admiral DAHLGREN.

(By signals.)

OFF MORRIS ISLAND, September 6, 1863—10 P. M.

GENERAL GILLMORE,—Does the signal for cease firing which I suggest in my last message, meet your approval?

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, September 6, 1863—10.30 P. M.

ADMIRAL DAHLGREN,—The signal for the assault will be the hauling down of the red flag on the Ironsides. I shall deploy some troops between Wagner and Gregg. Don't fire into them. I would like the monitors to engage Moultrie a little before nine o'clock. I would like to send a signal officer on board the Ironsides early in the morning.

General GILLMORE.

(By signals.)

MORRIS ISLAND, September 6, 1863—10.50 P. M.

ADMIRAL DAHLGREN,—We may expect a heavy fire from

Gregg to-morrow. Will you direct a very heavy fire on that battery as soon as the assault begins?

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, September 6, 1863—11.15 P. M.

GENERAL GILLMORE,—Three of the monitors will move over to engage Gregg at half after eight. The remaining monitors will keep up a rapid fire on Gregg.*

You can of course send a signal officer on board the Ironsides to facilitate communications. I shall be in signaling distance, however, if you should wish a different arrangement than that already agreed upon.

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, September 7, 1863—1.15 A. M.

ADMIRAL DAHLGREN,—A deserter just in reports Wagner evacuated. General GILLMORE.

(By signals.)

MORRIS ISLAND, September 7, 1863—4.15 A. M.

ADMIRAL DAHLGREN,—The monitors are not to fire on Cummings Point this A. M. General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, September 7, 1863—4.35 A. M.

GENERAL GILLMORE,—The monitors will not open on Gregg, or between Wagner and Gregg. Do you wish them to engage Moultrie two hours or so before the assault?

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, September 7, 1863—5 A. M.

ADMIRAL DAHLGREN,—We hold Wagner now, and are pushing on to Gregg. General GILLMORE.

(By signals.)

MORRIS ISLAND, September 7, 1863—5.10 A. M.

ADMIRAL DAHLGREN,—The whole island is ours, but the enemy have escaped us. General GILLMORE.

* This doubtless ought to read Wagner, and not Gregg.

(By signals.)

OFF MORRIS ISLAND, September 7, 1863—6.35 A. M.

GENERAL GILLMORE,—I have sent a flag of truce to demand the surrender of Sumter. If not complied with, I will move up with all the iron-clads and engage it.

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, September 7, 1863—3.20 P. M.

ADMIRAL DAHLGREN,—Have you received an answer to your summons to Sumter?

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, September 7, 1863—3.35 P. M.

GENERAL GILLMORE,—I have. He declined to surrender Sumter, or to receive any flag, till the firing on his steamer yesterday was explained.

Admiral DAHLGREN.

FLAG STEAMER PHILADELPHIA,
OFF MORRIS ISLAND, September 7, 1863.

GENERAL,—I desire to procure as large a side-wheel steamer as can cross this bar, to be used as a ram against the obstructions in the channel, between Sumter and Moultrie.

Have you a fast steamer under charter that could be used for this service? Such, for instance, as the Spaulding, or one of greater draft of water.

I have not a suitable one at my disposal.

I have the honor to be, very respectfully, your obedient servant,

J. A. DAHLGREN,
Rear-Admiral Comd'g. S. A. B. Squadron.

Gen. Q. A. GILLMORE, U. S. A.,
Comd'g. Dep. of South, Morris Island.

(By signals.)

OFF MORRIS ISLAND, September 8, 1863—2.30 P. M.

GENERAL GILLMORE,—I am going to assault Fort Sumter to-night.

Admiral DAHLGREN.

(By signals.)

MORRIS ISLAND, September 8, 1863—6.55 P. M.

ADMIRAL DAHLGREN,—Your dispatch by signal, stating that you intended to assault Sumter to-night, was received by me an hour after I had dispatched my letter, by one of my aids, informing you that I intended the same thing. There should be but one commander in an operation of this kind, to insure success and prevent mistakes. I have designated two small regiments. Will your party join with them, the whole to be under command of the senior officer, or, will the parties confer together and act in concert? The former method is much the best.

What do you say? General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, September 8, 1863—7.10 A. M.

GENERAL GILLMORE,—I have assembled five hundred men, and I cannot consent to let the commander be other than a naval officer.

Will you be kind enough to tell me what time you move, and what will be the watchword, to prevent collision. The rank of my commanding officer will be lieutenant-colonel, but if it will be of service in avoiding any question of rank I will send one of the rank of colonel, who has done the duty of commodore, the equal of brigadier-general.

Admiral DAHLGREN.

September 8, 1863.

ADMIRAL DAHLGREN,—You decline to act in concert with me, or allow the senior officer to command the assault on "Sumter," but insist that a naval officer must command the party.* Why this should be so in assaulting a fortification, I cannot see. I am so fearful that some accident will take place between our parties, that I would recall my own if it were not too late.

* Only a portion of above dispatch could be sent by signals. The whole was communicated verbally to Lieutenant Preston, of the admiral's staff, who was ashore early in the evening.

I sent you the watchword by special messenger, who has returned. We must trust to chance, and hope for the best. No matter who gets the fort, if we place our flag over it.

General GILLMORE.

(By signals.)

MORRIS ISLAND, September 10, 1863—12.45 P. M.

ADMIRAL DAHLGREN,—In reply to your letter of the 7th, asking if I had a large side-wheel steamer under charter, that would answer as a ram against the obstructions in the channel between Sumter and Moultrie, I beg leave to state, after making inquiry, that there is but one steamer in the department that meets the description, viz., the Ben Deford.

I hesitate to spare her for a use that would doubtless insure her destruction and seriously cripple my transportation, until I have time to get another to replace her. What time would you require her?

General GILLMORE.

(By signals.)

OFF MORRIS ISLAND, September 10, 1863—3.20 P. M.

GENERAL GILLMORE,—I hope you can spare the B. De ford. That the risk is great there is no doubt, but if suc cessful it should pay. I want to begin as soon as you can turn her over to me, and will return her the next day, if possible.

Admiral DAHLGREN.

FLAG STEAMER PHILADELPHIA,
OFF MORRIS ISLAND, September 26, 1863.

Major-General Q. A. GILLMORE, U. S. A.,
Commanding Department of the South:

DEAR SIR,—The rather limited means at my disposal for operating upon the interior lines of the harbor, render it very desirable that the enemy's resistance should be reduced as much as possible, by whatever means you may possess.

If, therefore, you can complete the reduction of Sumter

by your batteries on Cummings Point, it would be of material assistance to me in the outset.

I have no doubt I could do this with the iron-clads, but so much of their power has already been expended, and so much will be required after passing Fort Sumter, that it will be highly important to spare them as much as possible.

With Sumter in our possession, the obstructions, ranging from that work to Moultrie, whatever they are, would be removable with no great trouble and little risk, and I should advance upon the next series of defences with the least possible expenditure of means, and with the iron-clads in the best condition.

May I ask, therefore, when your batteries may be able to operate on Sumter, and whether I may depend on your driving the enemy out of it? I shall be glad to contribute any cannon which you may need to complete your works.

I think you will agree with me, that it is good policy to pursue this course, rather than to expend the monitors, of which I shall have only seven, and will need every one fully in attempting to make my way up the harbor.

I am, very respectfully, your obedient servant,

J. A. DAHLGREN,
Rear-Adm'l Comd'g. S. A. B. Squadron.

DEPARTMENT OF THE SOUTH, HEADQUARTERS IN THE FIELD,
MORRIS ISLAND, S. C., September 27, 1863.

Rear-Admiral J. A. DAHLGREN,
Commanding S. A. B. Squadron:

DEAR SIR,—I have to acknowledge the receipt of your letter of yesterday, asking me at what time my "batteries may be able to operate on Sumter," and whether you can depend on my "driving the enemy out of it," with a view to save the use of the monitors, of which "so much of their power has already been expended." I will open on Sumter at any time you are ready to move, even to-morrow morning, if you desire it.

I judge, from the general tenor of your communication, that the occupation of Sumter by us, or its evacuation by the enemy, is deemed essential, in order to secure the removal of the channel obstructions between it and Sullivan's Island, and insure the success of the naval operations pending in this quarter. This is a condition newly imposed, and somewhat grave in character.

That Fort Sumter possessed no power to harm the monitors in their passage up the harbor, when our breaching batteries ceased firing on the 1st instant, is, I believe, generally conceded. At any rate, the enemy freely admit it in their public prints, deserters and prisoners confirm it, and two successive engagements, each of several hours' duration, between the monitors and the Sullivan's Island batteries, failed to draw a shot from Sumter, although she was within easy range of the fleet. You will doubtless remember also your own statement, that it was not Sumter you feared, as its guns had been removed to Sullivan's Island. It is known, however, that one single gun (a smooth-bore 32-pounder) remained mounted in an embrasure looking directly towards Charleston, but it could not be brought to bear upon a vessel entering the inner harbor until she got well into Rebellion Roads, considerably over a mile distant.

What other guns the enemy may have placed there recently, taking advantage of the three weeks' lull in operations against him, is unknown to me.

As to the outer channel obstructions, and the present practicability of their being removed, the gun above referred to does not cover or protect them at all, and, according to the latest accounts, parties operating against them would be exposed to no fire from Sumter, except that of small-arms. What they would be likely to suffer from the Sullivan's Island batteries, if discovered, you are doubtless as well, if not better able to judge, than myself. The fire from that direction would, beyond question, be

immeasurably more severe than any that could be delivered from the ruins of Fort Sumter.

With regard, therefore, to our occupation of Sumter, as preliminary and accessory to the removal of the outer obstructions, it becomes a mere question of the comparative loss of life and probable success, likely to ensue from two distinct methods of operation, both having the same object in view, viz., the passage of the monitors by those obstructions. In other words, the question is, shall we attempt to carry Sumter by assault, and hold it under a concentric fire upon all its faces, from batteries within easy range, and occupying three-fifths of the circumference of a circle of which Sumter is the centre; or, shall we remove the channel obstructions abreast of Sumter, while the latter is held by the enemy? It is easy to see which of these operations is attended with the greatest degree of peril, and the least prospect of success.

I am myself willing to attempt the removal or destruction of the outer line of obstructions, rather than sacrifice men in carrying a work that possesses no power to harm our iron clad fleet, that has already repulsed one naval assault from small boats, that would be held with difficulty at the present time if we possessed it, and which must fall into our hands, whenever the naval part of the programme before Charleston is carried out. All the means at my disposal, I am willing to expend, freely and even profusely, in order to insure that measure of success which is expected of us.

I am unable to see any real advantage in sacrificing life in order to possess Sumter just now, and am ready to undertake the removal of such obstructions as are in any way protected by it.

I am just in the act of moving my headquarters to Folly Island, which has prevented my calling to see you to-day, as I intended to do.

Very respectfully, your obedient servant,

Q. A. GILLMORE, *Maj.-Gen. of Volunteers.*

FLAG STEAMER PHILADELPHIA, OFF MORRIS ISLAND,
September 29, 1863.

Major-General Q. A. GILLMORE,
Commanding Department of the South:

DEAR SIR,—Yours of the 27th in answer to mine of the 26th was received about 10 o'clock at night of the 27th. The reply contained in the first paragraph, that you "will open on Sumter at any time I am ready to move, even to-morrow if I desire," is entirely satisfactory, and meets the sole purpose of my letter, if you refer to the batteries from Wagner to Gregg, and here I should, therefore, have concluded this communication were it not for the strange misapprehension that pervades four subsequent pages of remarks, and which justice to myself requires me to notice. Whether one cannon is mounted on Sumter or more, and it be a 32-pounder, and look one way or the other, was not in my mind when I wrote the letter of the 26th.

I do know that the fort is capable of a severe musketry fire, which will prevent me from using boats to cut away rope obstructions, and compel me to risk the fouling of the propellers. If this fire did not exist it might be possible to cover the boats from Moultrie.

Now if Sumter can be rendered incapable of this musketry fire, by the fire of Cummings Point, it will relieve the monitors of the work, and this it is very desirable to do, because they have already expended nearly two-thirds of the endurance of their cannon, and sustained a loss of six weeks in repairing, in consequence of a co-operation of sixty (60) days in the reduction of Wagner.

This is the whole story, and surely there is nothing in a request so plain, that would lead to the construction which forms an argument of four pages. No consequences so momentous as need make my *first* request for co-operation so serious.

No assault is in question; if the cannon will not do it the remainder will be on my hands. Though I may say

that even an assault was not so remote from your calculations at one time.

I have not the slightest idea of "imposing any new condition" on you, whatever, but merely to ask the only cooperation that you can afford me, after having for sixty days yielded cheerfully to every request made of me. I do not ask you to put up batteries expressly for my convenience, but as you are so engaged only to use them when ready, for a certain probable advantage.

Nor do I ask you for assistance in removing the obstructions in the channel—there is nothing in my letter to warrant the idea, and your offer to do this—my proper work, sounds to me very much as mine would have sounded to you, if I had proposed to work the trenches when you asked me to keep down the enemy's fire.

I regret having to occupy your time and mine with these remarks, and will conclude as I began, by saying that the answer in your first paragraph meets all I have to ask, and that I shall not need even that before the repairs of the monitors are finished, which may not be for a couple of weeks.

I am very respectfully, your obedient servant,

JOHN A. DAHLGREN,

Rear-Admiral Commanding S. A. B. Squadron.

HEADQUARTERS DEPARTMENT OF THE SOUTH,
FOLLY ISLAND, S. C., September 30, 1863.

Rear-Admiral J. A. DAHLGREN,

Comd'g S. A. B. Squadron, off Morris Island, S. C.:

DEAR SIR,—I am in receipt of your letter of yesterday in reply to mine of the 27th.

I certainly did misinterpret the meaning of certain portions of your letter of the 26th, especially where you ask if you can depend on my "driving the enemy out" of Sumter, and where you speak of Sumter being in "our possession," as preliminary to the contemplated operation against the outer line of obstructions.

Your letter of the 29th I understand. I am expected to do what I have made and am making preparations to do, open a heavy fire on Sumter whenever the monitors are ready to move. I have several rifle guns on Cummings Point ready now, and am placing more guns there, and some mortars. Five of the breaching guns on my left remain in readiness to open at the same time.

Rifle guns cannot be safely used from Wagner while our troops occupy Gregg, as every projectile that tumbles is liable to drop into the latter work.

I believe I can prevent any annoyance from Sumter to parties operating against the outer obstructions, and may be able to accomplish much more, even to the occupation of the work.

I most cheerfully accredit to the ironclads much valuable co-operation in my operations here, but those operations have all had direct reference to the immediate end in view, viz.: the passage of those ironclads into the inner harbor. Every shot that I have fired, and every foot of trench that I have dug, have looked to that result, and have, I submit, been co-operation in the strictest sense of the term.

It appears to me, therefore, that if no special request of me for co-operation has been made by you before, it is simply because the land forces had to take the lead in executing the first part of the programme, and there was, consequently, no occasion for any such request.

It is now my time to play a subordinate part, and all the means under my control are at your disposal for that purpose.

What I stipulate for is a continuance of that cordial, opon and sincere interchange of views that have characterized our efforts thus far.

Very respectfully, your obedient servant,

Q. A. GILLMORE, *Maj.-Gen. Volunteers.*

FLAG STEAMER PHILADELPHIA, OFF MORRIS ISLAND,
October 15, 1863.

Major-General Q. A. GILLMORE, U. S. A.,
Com'g Dep't of the South, Folly Island, S. C.:

SIR—Under date of October 9th, the Navy Department observes:—"It would be satisfactory to be informed of General Gillmore's views, as well as your own, as the movements progress, in regard to further operations."

Now, General, I shall be very glad to give this information to the Department if you will enable me to do so. May I ask you, therefore, whenever it may suit your convenience, to put in my power to meet the wishes of the Hon. Secretary of the Navy, if you feel so disposed.

Very respectfully, your obedient servant,

JOHN A. DAHLGREN,
Rear-Admiral Comd'g S. A. B. Squadron.

DEPARTMENT OF THE SOUTH, HEADQUARTERS IN THE FIELD,
FOLLY ISLAND, S. C., October 17, 1863.

Rear-Admiral JOHN A. DAHLGREN,
Comd'g S. A. B. Squadron, off Morris Island, S. C.:

SIR,—In reply to your letter of the 15th inst., in which there is an extract from a communication from the Navy Department of the 9th inst., to the effect that it would be satisfactory to them to be informed of my views as well as your own, as our movements progress in this quarter, "in regard to future operations," I beg leave to state:—

1st. That I am now awaiting the repairs on the monitors, which, according to your letter of the 29th ult., were expected to be finished in a couple of weeks from that time. You explained to me day before yesterday, in an interview on board your ship, the reasons for the delay.

2d. When those repairs are completed, the monitors, agreeably to arrangements between us, and in fulfillment of that part of the original programme to which they are supposed to be peculiarly adapted, are to enter the inner harbor, and I am to keep down with my batteries any fire

of whatever kind from Sumter, and from other sources, as much as possible, while the obstructions are being removed and passed.

I have confidence in my ability to do this; I also believe the outer obstructions can be removed at night, without drawing any fire from Sumter. My picket boats passed around the fort frequently, undiscovered.

3d. I have placed Morris and Folly Islands in such a condition of defence, that they can be held by a small force, to enable me to spare from them, enough men, to take advantage of any success the ironclads may achieve in the inner harbor.

This is as far as my plans have been reported to the War Department. They are merely details of the original project, as the authorities at Washington will doubtless remember. With yourself, I have discussed matters more in detail. But I respectfully suggest that these details ought not to be reported to Washington, unless a special request is made for them by both War and Navy Department. I have little confidence in the safety of important secrets at Washington.

It would doubtless be proper for you to state to the Navy Department whether or not you have confidence in my ability to execute my plans of future operations, and whether, in their execution, you will secure the measure of co-operation you desire, and have a right to expect. In my opinion the Navy Department ought to be satisfied with that. Don't you think so, too?

I have the honor to be, very respectfully,

Your obedient servant,

Q. A. GILLMORE, *Maj.-Gen. Commanding.*

HEADQUARTERS DEPARTMENT OF THE SOUTH,
FOLLY ISLAND, S. C., November 26, 1863.

ADMIRAL,—The slow bombardment of Sumter requires considerable ammunition, and I propose to stop it, or, at

least, greatly diminish it, unless you think there is great advantage in keeping it up.

The only object for the last two weeks has been to prevent the enemy doing any work inside, while you are getting ready with your old monitors, and awaiting the arrival of new ones.

Very respectfully, your obedient servant,

Q. A. GILLMORE, *Maj.-Gen. Comd'g.*

To Rear-Admiral J. A. DAHLGREN,

Comd'g S. A. B. Squadron, off Morris Island, S. C.

NOTE.—Some unimportant letters and dispatches by signals, have been omitted from the foregoing correspondence between Admiral Dahlgren and General Gillmore, in order to keep down the size of this volume. The correspondence between General Gillmore and the General-in-chief, which was selected for publication, has been excluded for the same reason.

APPENDIX I.

STATEMENT OF R. P. PARROTT

I HAVE received a note from Major-General Gillmore, dated November 11, 1864, stating as follows:—

"It would afford me great pleasure to introduce in my report of operations against the defences of Charleston, an explanation, from yourself, of the causes of the premature explosion of your shells, and the bursting of your large guns."

I am at the same time informed that the space available for this explanation is very limited, while the time allowed is quite too short to prepare a suitable article even if there were room for it.

I will, however, (since publications are to be made) let no occasion pass for disseminating what I deem to be the truth on the subjects alluded to by General Gillmore, and will first repeat portions of my statement to General Ramsay, then chief of ordnance, made January 11, 1864.

"I am deeply sensible of the importance of the subject, and though I feel that we are not in possession of all the facts as they existed, I deem it proper to offer a few remarks, due as I think to myself, and possibly not without interest to the public service.

First.—I believe that when we consider the precautions which experience has proved to be proper in the use of rifle cannon; the effect of the premature explosion of shells, and the exposure of these guns to drifting sands, there will be little left to weigh against the evidence so generally given in favor of the safety of the guns themselves.

"*Second.*—There are some singular discrepancies in the circumstances attending the failure of guns at Morris Island, which go far to prove the operation of causes of a peculiar and accidental character, rather than defects in the guns. These are that the 100-pounders, by all known rules, the strongest of the three classes of heavy guns, and which endured so well at the first bombardment (one to 1,150 and another not failing at 1,450 rounds) should, at the second, have failed in several instances; the exposure to sand in the latter case being such as to make it proper to dispense with greasing the projectiles.

"Again, the 300-pounders, which should have failed the soonest of the three calibres, *were the system defective*, have stood well. It is true the first was disabled by the bursting of a shell in the bore, but it sustained well the proper strain of the discharge; and the second, though known to have a defect in the bore, had endured 500 rounds, and must, from unofficial information, have been used still further. And in regard to the 200-pounders I have before pointed out the facts connected with the service of two of these guns in the naval battery, which I understand to have been fired 660 rounds each, at the first bombardment, and kept for further use in other batteries.

"*Third.*—The failure of guns from the blowing off the muzzle, or any part of the cast iron forward of the band, *must* be attributed to the premature explosion of shells, or the existence of obstructions in the bore, accidentally introduced therein, though the same cause *may* also have brought about the destruction of the guns in other parts, as by the blowing out of the breech, of which one case occurred where the shell was found wedged in the bore."

REMARKS.

The second 300-pounder alluded to was fired to 1,007 rounds. It then failed like the first by blowing off the

muzzle. This gun was fired at the foundry 201 rounds, making a total of 1,208 rounds.

My guns are strengthened in reference to the strains usually causing the bursting of guns not banded. When they give way they naturally do so in a peculiar manner. If lateral bursting is made very difficult, the blowing out of the breech does not prove that the banding is the cause, but merely that it transfers the bursting to another place where greater force is required to produce it, and thus truly strengthens the gun.

In the small number of accidents which have happened with my guns in the naval service, not one has occurred from the blowing out of the breech.

In no case is there evidence that a fracture has *commenced* directly in front of the band.

In some, it is clear that the fracture, commencing much forward of the band, has been prevented by it, from extending and becoming dangerous.

I believe that not one 200-pounder or 8-inch rifle, has burst in the naval service.

Can a theory unfavorable to the guns be reconciled with so many discordant facts, or apply to one branch of the public service only?

The fact of the premature explosion of rifle shells being beyond doubt, it was attributed, first, to their bad quality, and then to the fuses; but not being prevented by all possible attention to these points, it became evident that the friction or attrition of the powder within the shell itself, was the true cause of most of the premature explosions.

In proportion as care has been taken to cover the rough surface of the interior of shells with varnish or lacker, the explosions have diminished, until, with a lacker of asphaltum, as now prepared here, applied to the interior of 450 loaded shells, not one has exploded prematurely.

I have been frequently asked, Why do *your* shells explode prematurely, while the spherical do not?

I reply that neither do my shells explode, *with the charge of the spherical* of the same calibre.

The 10-inch spherical shell holds 3¼ pounds of powder, the 300-pounder or 10-inch rifle shell 16 pounds, and in the rifle shells generally, the charges are from three to four times greater than in the spherical of the same calibre.

It was long the practice here in proving rifle guns, to use for the shells the following charges: 10-inch four pounds, 8-inch two pounds, 100-pounder (32-pounder calibre) one pound. These are very nearly the charges of the like spherical shells, and rarely, if ever, was there a premature explosion. These charges were deemed sufficient to test the soundness of the shells, action of fuzes, &c. But on *filling up* the rifle shells, numerous premature explosions took place, and led to the conclusion that the greater weight of powder in a long column did, by its increased reaction against the base of the shell, pressure, and consequent friction, cause the explosion. A conclusion manifestly sustained by the effect of coating the interior, already described. It may be added that though explosions have occurred most commonly within the bore, some are so far outside the gun as to make it probable that they are aided, if not produced, by friction due to the *rotation* of the shell.

Doubtless these premature explosions of shells often occur without serious injury to the gun, but from the fact that the rifle shell is engaged in the grooves, as well as its large charge of powder, and possible jamming of the fragments, some, among numerous premature explosions, will probably lead to the destruction of the gun.

Many important considerations in regard to the peculiar service of rifle cannon and the effect of sand with a close fitting, sliding projectile, would form a proper part of such an explanation as the importance of the subject would call for. At this time, however, I cannot extend my remarks.

In conclusion I would say that I believe I have given the true explanation of the causes of the premature explosions

of my shells, as well as the bursting of some of my large guns at Morris Island.

In so new a field of enterprise, accidents, not necessarily connected with rifled ordnance, but the *result* of want of experience, were to be expected. That my guns have encountered difficulties, (now as I think remedied) because so early in that field, so largely called for and used, cannot justly operate to their prejudice.

R. P. PARROTT.

WEST POINT FOUNDRY, Cold Spring, November 15, 1864.

Road to Savannah
Thompson
Ravenel
Ft. Pemberton
Hayward
McLeod
ASHLEY RIVER
White Pt.
Hog Island Channel
No. 1
No. 2
No. 3
South
Shies
Tyers
Fort Johnson
Simkins
Holmes
Royall
Revd Douglas
Dills Bluff
Drayton
Holmes
Newtown Cut
Mellchamp
Meerschaum
T. Legare
Ryan
JAMES ISLAND

Plate 1.

Rivers
Dills
Red Church
Clarkes
J. M. Krepp
Secessionville
Bat.y Lamar
Dr. Thos. Grimballs
Bat.y Wright
Paul Grimball
Legareville
JOHNS I.d
STONO RIVER
STONO
FOLLY RIVER
LIGHT HOUSE
BROAD ISL.

PRELIMINARY CHART OF

CHARLESTON HARBOR

AND ITS APPROACHES

From a Trigonometrical Survey

under the direction of A.D. BACHE. Superintendent of the

SURVEY OF THE COAST OF THE UNITED STATES

Triangulation by C.O. BOUTELLE. Assistant

Topography by S.A. GILBERT & J. SEIB. Assists. & W.S. EDWARDS

Hydrography by the Parties under the command of

Lieuts. J.N. MAFFITT & T.B. HUGER U.S.N. Assts.

Published in 1858

Scale 1:80000

Statute Miles

Nautical Miles

Lith. of J. Bien, 24 Vesey St. N.Y.

D. Van Nostrand. Publisher.

MAP
OF
SIEGE OPERATIONS
against the
DEFENSES OF CHARLESTON HARBOR
1863

SHOWING BATTERIES COVERING THE DESCENT UPON MORRIS ISLAND, JULY 10,
and the subsequent operations resulting in
THE DEMOLITION OF F.T SUMTER AND THE CAPTURE OF F.TS WAGNER & BATT.N GREGG,
SEPTEMBER 7.

Assis.t Engineers

Colonel Edward W. Serrell, N.Y. Vol. Eng.rs — *Capt. C.B. Reese U.S.E.*
Major T.B. Brooks A.D.C. — *Lieut. C.R. Suter*
Lieut. P.S. Michie U.S.E.

Head Quarters Dept. of the South
MORRIS ISLAND S.C. SEPT. 27. 1863.

Official J. Gillmore
Major General Commanding & Chief Engineer

Fort Sumter

Battery Gregg

Fort Wagner

Vincent's Creek

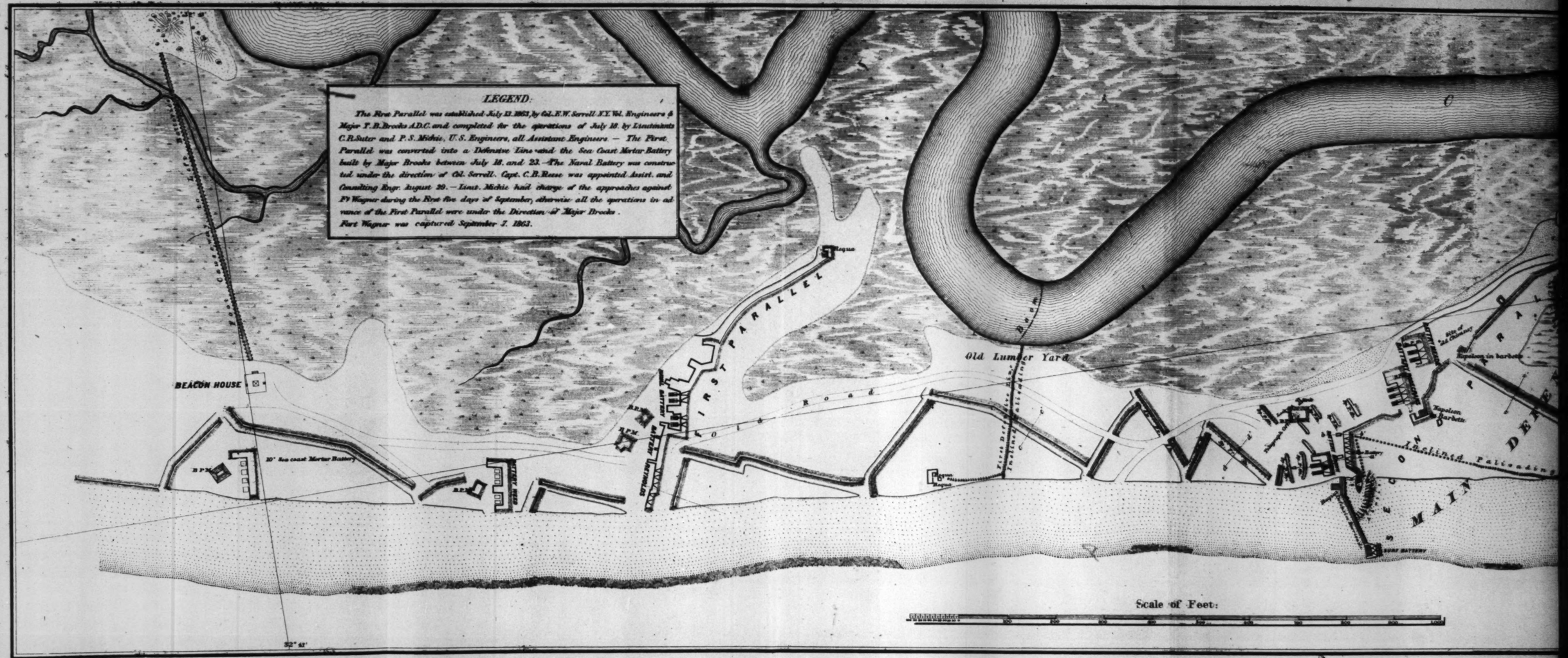
Beacon House

Outcrop of blue clay

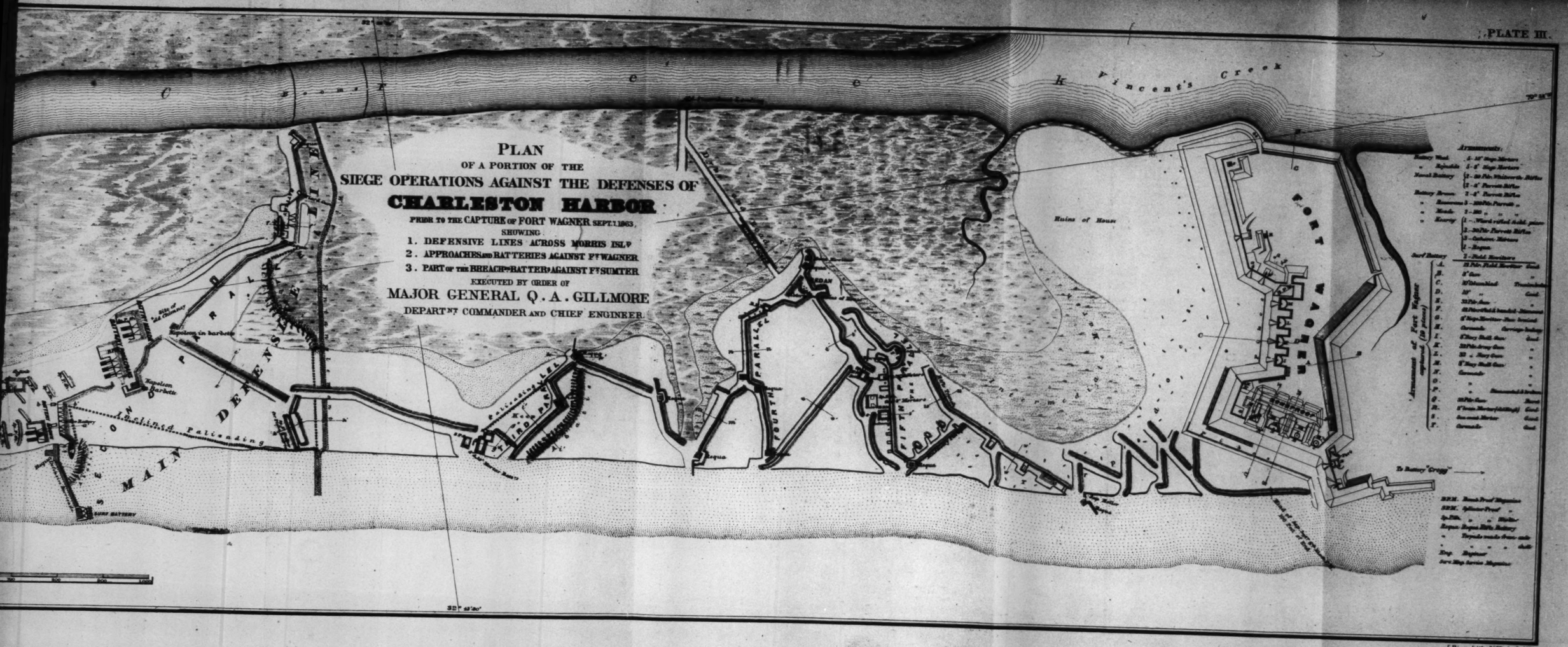
YARDS.

STATUTE MILE.

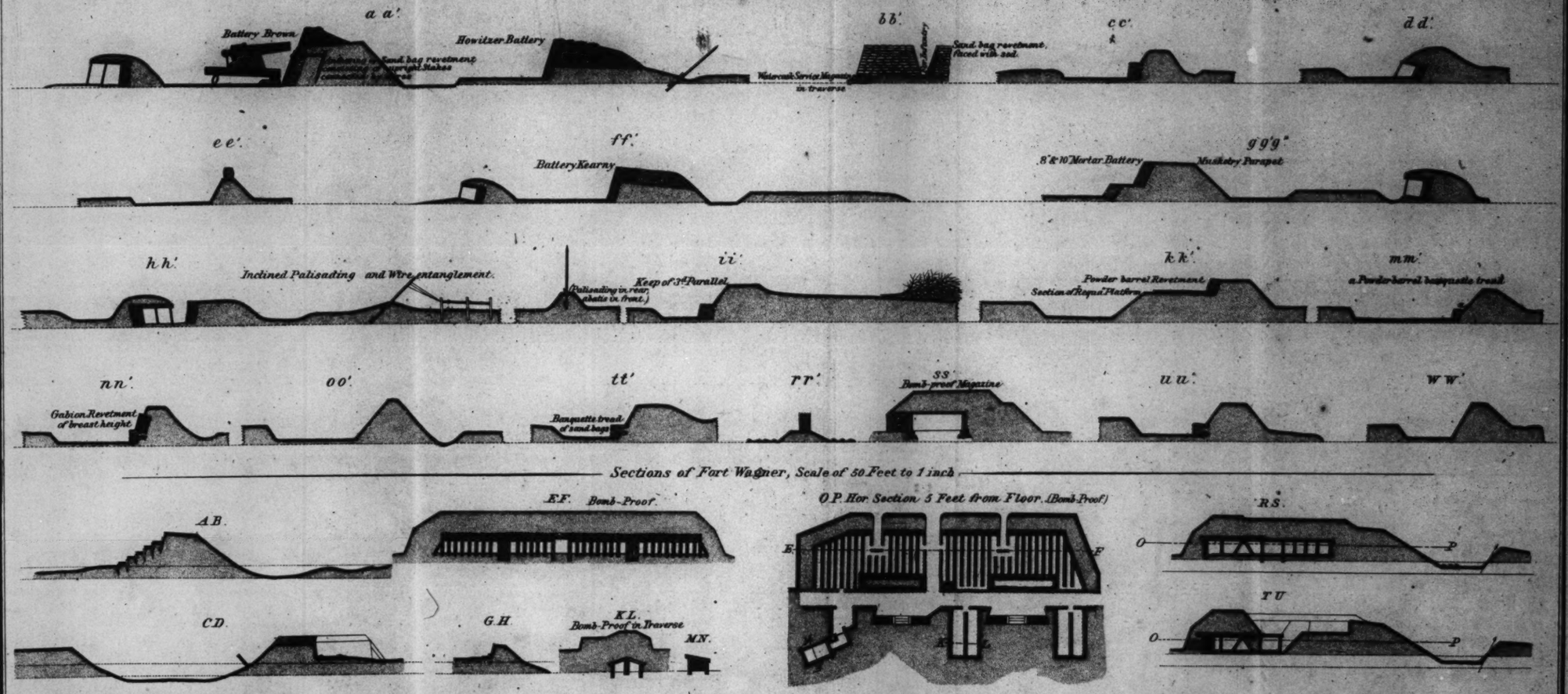
Lith. of J. Bien. 24 Vesey Street N.Y.



H Van Nostrand, Publisher.


PLAN
OF A PORTION OF THE
SIEGE OPERATIONS AGAINST THE DEFENSES OF
CHARLESTON HARBOR
PRIOR TO THE CAPTURE OF FORT WAGNER SEPT. 1. 1863.
SHOWING
1. DEFENSIVE LINES ACROSS MORRIS ISL.D
2. APPROACHES AND BATTERIES AGAINST FT WAGNER
3. PART OF THE BREACH & BATTERY AGAINST FT SUMTER
EXECUTED BY ORDER OF
MAJOR GENERAL Q. A. GILLMORE
DEPARTT COMMANDER AND CHIEF ENGINEER
Vincent's Creek
Ruins of House
FORT WAGNER
MAIN DEFENCE
Enclosed Palisading
Parallel
Fourth Parallel
Fifth Parallel
Sand Hills
Redoubt
Bomb Proof
Magazine
Furnaces
Traverse
Sally Port
Gorge
Scarp
Counter Scarp
Ditch
Glacis
Parapet
Embrasure
Platform
Barbette
Casemate
Bomb Proof
Sand Bag
Gabion
Fascine
Abattis
Palisade
Wharf
Pier
Landing
Road
Path
Creek
Marsh
Sand
Water
Ammunition
Armament of Fort Wagner
To Battery "Gregg"
J. Bien, Lith. 26 Vesey St. N.Y.

Sections of Approaches, Scale of 25 Feet to 1 inch.



D. Van Nostrand, Publisher.

J. Bien, Lith.

PLAN

of a portion of the

SIEGE OPERATIONS AGAINST THE DEFENSES OF CHARLESTON HARBOR

showing

THE LEFT BATTERIES.

1, Batteries erected against Fort Wagner prior to July 18th 1863.

2., Part of the Breaching Batteries erected against Fort Sumter used also against Fort Wagner and Battery Gregg.

Executed by order of Maj. General **Q. A. GILLMORE**, *under direction of*

Maj. T. R. BROOKS, *A.D.C.* Lieut. C. R. SUTER, *U.S.E.* and Lieut. P. S. MICHIE, *U.S.E.*, ASSISTANT ENGINEERS.

A. B.

C. D.

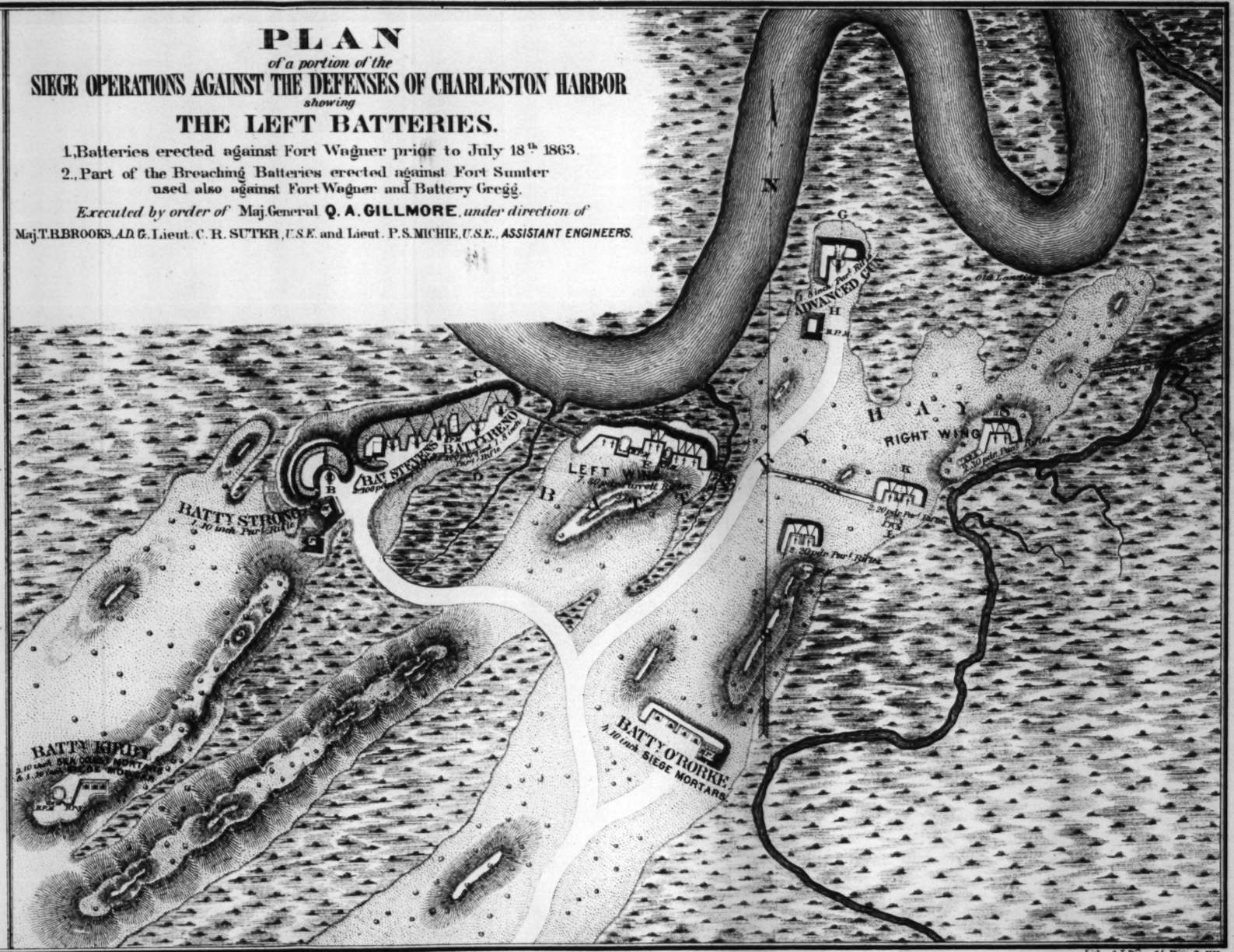
E. F.

G. H.

K. L.

Note. *Abreviations.*

B.P.M. *Bomb-proof Magazine.*
B.P.S. " " *Shelter.*
S.P.M. *Splinter-proof Magazine.*
S.P.S. " " *Shelter.*
Par.t *Parrott.*



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